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GENERAL NEWS SECTION.....

*Illustrated.

The oil lands of the Southern Pacific, which are variously estimated to be worth from \$250,000,000 to over \$500,000,000, have

The Southern Pacific Oil Lands

been carried among the assets of the Southern Pacific Company at a nominal valuation. The Supreme Court of the United States on Monday has held in effect, it would seem, that the Southern Pacific's title to these lands is clear; in other words, that the Southern Pacific has assets of enormous value not shown on its balance sheet. The law which granted to the transcontinental railroads alternate sections of land, provided that mineral lands should not be included. When the interior department of the government, however, was called on to issue patents for the specific lands which the transcontinental roads had become entitled to through fulfilling their contracts under the law, it was, the railroad companies contended, and the Supreme Court now

affirms, the duty of this department to determine whether or not the lands were mineral lands. This department could not pass along in perpetuity the limitation which was constitutional in the law, namely, the exemption of mineral lands. The Supreme Court has taken the common sense view that the original land grant laws were framed in such a way as to give the interior department latitude in the matter of the specific lands which they granted to each railroad company as it fulfilled conditions of the grant. The government officials, however, when called on to perform their duties, could not, the Supreme Court holds, shirk this duty by in effect saying, "If we have made a mistake our action is void," or "if a thousand years from now conditions should be different from what they are now, our present action can be revoked." The illustrations are our own, but apparently they are in the spirit of the court's decision. It appears that this decision settles the land grant controversies with two exceptions. If the government can show fraud in the application for certain lands, it may recover these certain lands. In a case which is pending in Oregon certain lands were granted to a subsidiary of the Southern Pacific on condition that the lands should be sold to settlers at or below a certain price, and the government claims that these conditions were not complied with. These two exceptions, both of minor importance as compared with the main issue, are still to be settled.

One who goes into the business of giving entertainments must be resourceful in the elements of variety and novelty, which are

Novelties in Railroad Instruction

essential ingredients in everything of the kind. Many railroad officers have had this forcibly impressed on them by their experiences in teaching the "safety-first" idea; and it is interesting to note the different ideas of entertainment that have found expression in this development in different parts of the country. To require an employee to study a rule or perform a specific piece of work, and then make tests to see that he has done what he was told to do, is a comparatively simple matter, but teaching "safety first" is quite another problem. It involves so many different things, and things that in such a large degree must be left wholly to the individual's own judgment and initiative, that the hard-and-fast methods of giving instruction in the train rules, with the requirement of absolute obedience, have to be laid aside; the teaching is informal and the learning voluntary. Attendance of learners being voluntary, the element of entertainment has naturally been added, for the purpose of stimulating interest, and so it has come about that music by a band, the attendance of ladies, and other features not "strictly business" have come to be common incidents of safety-first meetings at many places. A brass band adds to the expense. Ladies will not enjoy the meetings forever. "Entertainment" in its narrow sense detracts from, rather than adds to, the force of the lessons which it is desired to inculcate. To insure satisfactory permanence something more substantial may be necessary. But how can the interest be kept up from year to year? The foregoing reflections are the result of reading of proposals to use motion pictures. The Pennsylvania, so far as we recall, is the only road that has tried these in "safety first," and it was found rather difficult to carry out the idea with entire satisfaction. Will it pay to take up this means of instruction extensively? We ask this question, not for the purpose of answering it, but to get information.

The question whether motion pictures will be useful as a means of inculcating the "safety-first" idea, is partly answered by the

Motion Pictures on the Pacific Electric

fact that they have already been used, and with much satisfaction, in teaching train rules. This is on the Pacific Electric Railway in southern California. That company has over 4,000 feet of films, and we are assured that the officers deem their use so valuable that they "would not under any circumstances" consider the giving

up of the pictures. The Pacific Electric is not in all respects like a standard railroad, but it has nearly a thousand miles of line, over half of which is credited in the *Official Guide's* mileage list; and it has 272 miles of double track. Motion pictures have been used for about six months, and the company has a first class outfit with which to do the necessary photographing. The lecturer begins with a stereopticon reproduction of a certain rule from the rule book—it is one important point to know that an employee has actually read a rule—and then he shows an "accident" or a "near-accident" caused by failure to obey that rule. This in turn is followed by a portrayal of just what the person at fault ought to have done under the given circumstances. Some of the films were prepared with the aid of professional actors, and the pictures are dramatic as well as instructive. Trainmasters who have found themselves unable to properly impress important rules on dull minds can perhaps find a hint in this employment of experts in the art of making a hit. Accidents are not the whole of the show by any means; all kinds of signals are displayed and operated, and also train movements and switching. The instruction classes take less time than formerly, while more men can be instructed at once, and there is never any lack of interest. If the question of cost is satisfactorily answered there would seem to be no risk in predicting for this scheme a wide popularity.

THE CONSULTING ENGINEER IN RAILROAD WORK

A SHORT time ago a grand jury seriously criticized the Board of Water Supply of New York City for employing consulting engineers from time to time when it already maintained a large engineering staff, intimating that this staff should have been capable of solving all the engineering problems arising. This feeling is often manifested by railway officers. It may be well, therefore, to point out some of the reasons for calling in consulting engineers on railway work from time to time, a practice which is increasing to a considerable extent.

On many roads of relatively small mileage the number of problems requiring high-grade engineering ability are few, and it is obviously more economical for such roads to call in outside engineers specializing on important problems, as these problems happen to present themselves on such roads, than to employ regularly a corps, even though small, of sufficient ability and special knowledge to handle such problem. The field for consulting engineers is not, however, limited to the smaller roads. There is a definite need for their services in the solution of special problems on large roads with well organized engineering departments. While a large proportion of the routine problems coming up can be dealt with to best advantage by men regularly employed by a road and familiar with its conditions, there are others of a special nature and magnitude which demand the employment of outside experts who specialize in these particular classes of problems and who have the advantage of experience in dealing with similar matters on many roads. When such matters come up even on a large road there is entire justification for calling in consulting engineers. Few roads can keep in their employ men who have become authorities on the subjects of economics of grade reduction, the design of large terminals, bridges or stations, and so on. Here the large road is in a position similar to that of the smaller road, in that it can advantageously use the expert services of these men of specialized experience, but cannot afford to employ them permanently. The engineering expense of any work is so small a part of the total, and is at the same time so important in determining the total cost of the work and in its ultimate value that a road can well afford to secure the best talent available, in a consulting capacity at least. Aside from these larger problems the field of railway construction and operation has become so highly specialized that an expert from the outside is frequently able to suggest improvements which do not occur to the local officers who are closer to the work.

THE INTERMOUNTAIN RATE DECISION

THE Supreme Court of the United States on Monday reversed the Commerce Court and held that the decisions of the Interstate Commerce Commission in the so-called intermountain rate cases reducing rates to points intermediate between the Rocky Mountains and the Sierra Nevadas, and fixing zone scales of rates in place of blanket rates heretofore in effect, are binding. The all-important point of law which the court has determined is that the Interstate Commerce Commission has power to prescribe zone rates; in other words, to prescribe a comprehensive scheme of rates. A second and less important point, because one on which there was less doubt, is that the fourth section is not unconstitutional on the ground that it is a delegation of legislative power, since the standard set for the commission is definite enough to form a guiding principle in its granting of relief under the fourth section.

It is not at all improbable that the Interstate Commerce Commission is busily engaged in rewriting parts of its pending decision in the 5 per cent. rate increase case. It will be recalled that Mr. Brandeis, as counsel for the commission, urged with all the solemnity and conviction at his command that the Interstate Commerce Commission did not have power to grant a general increase in rates and that Mr. Patterson, of the Pennsylvania, for the roads, just as earnestly contended that the Interstate Commerce Commission did have the broad power to prescribe a general scheme of rates. It is inconceivable that the Supreme Court, in rendering its intermountain decision, was unaware that it was passing on a broad question, another aspect of which was being considered by the Interstate Commerce Commission. The Supreme Court has apparently given its stamp of approval to Mr. Patterson's theory as opposed to that of the Commerce Commission's counsel. The commission has the power to grant the relief needed by the roads.

As to the direct effect of the decision, it apparently puts the railways back in the position in which they found themselves following the issuance of the commission's order, and before it was decided to litigate the questions involved. That is, they must decide whether to adopt the apparent intention of the commission and reduce rates to the intermountain territory with relation to the coast rates, or to advance the coast rates to avoid reducing the other rates. This aspect of the case was fully discussed in the *Railway Age Gazette* of July 28, 1911, page 162; and September 22, 1911, page 548.

The effect of the commission's order prescribing percentage relations between the rates from the territory east of St. Paul and the Missouri river to the Pacific coast, and to intermediate points obviously is to make all of the rates from all parts of the country to the western interior dependent upon the rates to the Pacific coast. If the commodity rates to the coast be left by the railways as they are now then reductions in the commodity rates to the western interior must be made, which would involve a large reduction in revenue. But the railways are left free to establish the relations prescribed by the commission either by advancing the rates to the coast or by reducing them to the interior, choosing whether they will desist from meeting water competition on the coast and thereby putting themselves in a position to maintain their rates to the interior, or will continue to meet water competition on the coast, and thereby subject all their rates to its influence.

The commission in its decision referred to the fact that water competition is more potent than it has been in many years. With the approaching opening of the Panama Canal it will become much stronger than it is now. If the railways continue to meet water competition under the decision every decline in water rates would reduce not only the revenue on their business to the coast, but the revenue from all their business.

This is no easy question for the railways to decide, especially as the different lines have varying interests. A reduction in the rates to the intermountain territory would undoubtedly tend to build up the traffic of that section, but at the expense of the

coast territory, and the coast traffic, even at low rates, is not to be lightly ignored. But if the coast traffic can only be had at rates which are not only likely to be seriously reduced by canal competition themselves, but also to pull down the intermediate rates at the same time, it may be a practical necessity for the railways to abandon the coast business to the water lines and devote their energies to more remunerative traffic.

In any event the question will hardly be decided without many conferences with the commission. The rates involved were prescribed by the commission three years ago, when the canal as a factor to be taken into consideration was still far in the future. Other conditions have changed in the meantime, and much of the bitterness of the original controversy has been lost. While the case has been pending in the Supreme Court compromise rates have been in effect somewhat higher than those named by the commission, which have been temporarily satisfactory both to the commission and to the shippers. It is quite possible that all of the interested parties may be able to get together and agree on an adjustment that will prove more satisfactory than any of the three previous decisions of the commission.

This intermountain case is the culmination of a long series of Supreme Court decisions which have added here and added there to the power of the Interstate Commerce Commission until now, with this question of a general scheme of rates determined in favor of the commission by the court, the Interstate Commerce Commission is vested apparently with powers of rate making and management of the roads such as were never wielded by any railroad manager or any group of railroad managers. It places in the hands of seven men, whose aggregate salary is \$70,000, the final responsibility for the management of an 18 billion dollar industry.

THE EXTENT OF GOVERNMENT OWNERSHIP

ARCHIV FÜR EISENBAHNWESEN, the official publication of the Prussian Ministry of Public Works, has again issued its compilation of the railway mileage statistics of the world, showing the mileage of railways owned by governments and by private companies for the years 1911 and 1912. The previous compilation was issued in 1912, and the figures were published in the *Railway Age Gazette* for July 19, of that year, page 85. Railways owned by governments are listed as state railways, whether they are actually operated by the government or by private companies. The figures for 1912 are as follows, with the kilometers converted into miles:

EUROPE			
Country	Private railways	State railways	Total
Germany	2,750	36,200	38,950
Austria-Hungary	5,400	23,000	28,400
Great Britain	23,400	.....	23,400
France	25,660	5,540	31,200
Russia (in Europe)	14,200	24,400	38,600
Italy	1,870	8,930	10,800
Belgium	2,680	2,690	5,370
Luxemburg	204	122	326
Netherlands	880	1,100	1,980
Switzerland	1,290	1,700	2,990
Spain	9,540	.....	9,540
Portugal	1,155	695	1,850
Denmark	1,124	1,216	2,340
Norway	290	1,630	1,920
Sweden	6,090	2,760	8,850
Servia	226	356	582
Roumania	80	2,160	2,240
Greece	1,000	.....	1,000
Bulgaria	.....	1,200	1,200
Turkey (in Europe)	1,045	.....	1,045
Malta, Jersey, Isle of Man	68	.....	68
Total miles	98,952	113,699	212,651

AMERICA			
Country	Private railways	State railways	Total
Canada	24,930	1,770	26,700
United States	249,789	.....	249,789
Newfoundland	770	.....	770
Mexico	7,990	7,860	15,850
Central America	1,621	359	1,980
Greater Antilles	3,240	150	3,390
Lesser Antilles	336	.....	336
Colombia	511	110	621
Venezuela	564	68	632
British Guiana	103	.....	103

Country	Private railways	State railways	Total
Dutch Guiana	37	.....	37
Ecunder	650	.....	650
Peru	610	1,050	1,660
Bolivia	895	.....	895
Brazil	7,400	6,400	13,800
Paraguay	230	.....	230
Uruguay	1,640	.....	1,640
Chile	1,980	1,980	3,960
Argentina	18,110	2,490	20,600
Total miles	321,406	22,237	343,643

ASIA			
Country	Private railways	State railways	Total
Russian Central Asian Territory	1,090	2,970	4,060
Siberia, Manchuria	2,920	3,830	6,750
China	6,100	.....	6,100
Japan, including Korea	1,980	4,860	6,840
British India	4,100	29,300	33,400
Ceylon	580	.....	580
Persia	33	.....	33
Asia Minor, etc.	2,370	910	3,280
Portuguese Indies	51	.....	51
Malay States	860	.....	860
Dutch Indies	210	1,380	1,590
Siam	110	590	700
Cochin China, etc.	2,290	.....	2,290
Total miles	22,694	43,840	66,534

AFRICA			
Country	Private railways	State railways	Total
Egypt	880	2,790	3,670
Algeria and Tunis	2,160	1,800	3,960
Belgian Congo	860	.....	860
Union of South Africa:			
Cape Colony	410	3,400	3,810
Natal	40	1,050	1,090
Central South Africa	280	3,090	3,370
Rhodesia	2,350	.....	2,350
Colonies—			
Germany:			
German East Africa	.....	745	745
German Southwest Africa	.....	1,300	1,300
Togo	.....	200	200
Kamerun	.....	150	150
English	640	1,310	1,950
French	1,940	.....	1,940
Italian	96	.....	96
Portuguese	1,000	.....	1,000
Total miles	10,656	15,835	26,491

AUSTRALASIA			
Country	Private railways	State railways	Total
New Zealand	120	2,760	2,880
Victoria	160	3,520	3,680
New South Wales	340	3,760	4,100
South Australia	100	2,080	2,180
Queensland	630	4,000	4,630
Tasmania	230	470	700
West Australia	1,040	2,380	3,420
Hawaii, etc.	88	.....	88
Total miles	2,708	18,970	21,678

SUMMARY					
Private railways		State railways		Total	
1910	1912	1910	1912	1910	1912
Europe	99,497	98,952	107,490	113,699	206,987
America	314,187	321,406	12,170	22,237	326,357
Asia	26,537	22,694	36,651	43,840	63,188
Africa	9,204	10,656	13,646	15,835	22,850
Australasia	1,234	2,708	17,995	18,970	19,229
Total miles	450,659	456,416	187,952	214,581	670,997

It will be seen that of the total mileage of the world for 1912—670,997 miles—private companies owned 456,416 miles, or 68 per cent., and governments owned 214,581 miles, or 32 per cent. In 1911 the total mileage was 654,435, of which companies owned 456,881, or 69.8 per cent., and governments 197,554, or 31.2 per cent. In 1910 the total mileage was 638,611, and the private companies owned 450,659 or 70.57 per cent., while governments owned 187,952 or 29.43 per cent. As compared with the 1910 figures there was an increase in the total railway mileage of the world of 32,386 miles, while the increase of government owned mileage was 26,629, and the increase of privately owned mileage was 5,757. As a matter of fact, however, there has not been as much change in the proportion of private to state railway ownership in that period as these figures seem to indicate.

It will be noted that 7,860 miles of railway in Mexico are included under state railways, whereas in 1911 and 1910 this mileage was credited to companies. A majority of the stock of the National Railways of Mexico is owned by the Mexican government and has been since before the 1910 compilation was

made. The transfer of nearly 8,000 miles of lines in Mexico from the private to the state column would have made the percentage of privately-owned railway in 1910 69.2 per cent. instead of 70.57, and in 1911, 68.4 per cent.

Archiv fur Eisenbahnwesen states that although most of its figures are derived from the official sources where they were available it has been obliged to depend in part on unofficial figures, and that its compilation makes no pretense of absolute accuracy, but is only intended to show the approximate proportion of state and private railways.

The greatest increase in government-owned mileage is shown in the figures for America, where the total of state lines was increased by 10,067, mainly by the transfer of the Mexican mileage, but also by 359 miles in Central America, 110 in Colombia, and 68 in Venezuela, where there was none in 1910, a slight increase in the Greater Antilles, and an increase of 208 in Peru, 300 in Chile and 969 in Brazil. America also shows an increase of 7,219 miles in company mileage, principally in the United States and Canada, which is far greater than the actual increase of state railway mileage since 1910.

In Europe the government mileage increased 6,209 miles, principally by extensions of the existing government systems in Germany, Austria-Hungary, Russia, Italy, Norway and Bulgaria, and by absorptions of private lines. The private mileage in Europe decreased 545 miles.

Asia shows an increase of 7,189 miles of government-owned mileage, and a reduction in private mileage of 3,843 miles. The principal change was in British India, where the state mileage increased from 24,406 to 29,300, while the privately-owned lines decreased from 7,615 to 4,100.

In Africa government-owned mileage increased 2,189 miles, while the private mileage increased 1,452, 1,800 miles of new state-owned line having been added in Algeria and Tunis, while the private mileage in those countries decreased from 3,127 to 2,160. The Rhodesian mileage of 2,350 miles, however, has been transferred to the company-owned column. In the compilation for 1910 it was erroneously included in the state mileage.

In Australasia state mileage increased 975 miles, while the company mileage shows an increase of 1,474.

The total increase of state mileage, as previously stated, is 26,629, while the increase in private mileage in America, Africa and Australasia totals 10,145. This is partly offset by the decrease of 4,388 miles in Europe and Asia. While measured by length of line private ownership is still overwhelmingly the railway policy of the world, the bulk of the privately-owned mileage is in the United States, the length of line in this country in 1912 being reported as 249,789 miles, which is 35,208 more than the aggregate length of all the state-owned railways in the world. Outside of the United States the mileage owned by companies is 206,627, or 7,954 miles less than the government-owned mileage.

As the *Railway Age Gazette* pointed out in connection with the 1910 figures, it cannot be said that even in point of mileage government ownership has become the policy of most of the leading countries of the world. All of the railways in the United States, Great Britain, Spain and China are in the hands of private companies, and most of those in Canada; in France three-fourths of the mileage is privately-owned, and in Sweden nearly two-thirds; in Brazil and Argentina company mileage is greatly predominant. It is noteworthy that in North and South America there is only one country, Peru, in which there is more government than private mileage. On the other hand, in Germany, Austria-Hungary, Russia and Italy government ownership is the dominant policy, Japan is committed to state ownership, and in India the state-owned mileage greatly predominates. In India, however, the bulk of the state-owned mileage is leased to, and operated by, private companies, and in Mexico all of the lines are operated by companies.

There are 26 countries in the list given by *Archiv fur Eisenbahnwesen*, where there is no state-owned mileage and only 5 where there are no privately-owned railways, while the pri-

vately-owned mileage is greater in 39 countries as against 36 where government ownership predominates.

THE UNITED STATES STEEL CORPORATION AND ITS EMPLOYEES

AT stockholders' meetings in England there is sometimes pretty lively heckling of directors, but the reports of stockholders' meetings in this country usually consist largely of the announcement by the chairman of the board or the president that he has proxies for 98 per cent. of the stock and a motion that the action of the directors and the acts of the management be approved.

The proceedings of the last annual meeting of stockholders of the United States Steel Corporation are, therefore, almost unique. It will be recalled that nearly two years ago Mr. Cabot started an agitation to have a thorough investigation of labor conditions made independent of the United States Steel Corporation management. A committee was appointed consisting of Judge Gary, President Farrell and Percival Roberts, Jr. A report of this committee was submitted to the stockholders at the last annual meeting and not only proved satisfactory to Mr. Cabot, but showed that labor conditions in the United States Steel Corporation plants were considerably better than the average conditions in like industries. The very remarkable thing, however, about this annual meeting was the fact that a number of the stockholding employees of the corporation were present and were represented by certain of their fellow workmen and fellow stockholders who gave their own views of conditions.

The United States Steel Corporation has been remarkably successful in carrying out a plan for inducing its employees to invest in preferred stock of the corporation on a monthly subscription basis on terms which are highly advantageous to the employee. At the end of 1913 there were 35,026 employees who were stockholders, and they held in the aggregate \$14,646,200 par value of stock, all or nearly all of which is preferred. There are about 229,000 employees of the Steel Corporation, so that over 15 per cent. are stockholders. This is a specially noteworthy fact, since a large proportion of the Steel Corporation's employees are Slavs and foreigners from other countries, and a very small proportion of them are of the class, insofar as education and natural advantages are concerned, of railroad conductors or enginemen.

There were five employees who spoke at the stockholders' meeting. One was a workman in the National Tube Company's plant at Elwood City, Pa.; one a water tender at the Carnegie New Castle works; one a sheet iron heater at the Canal Dover, Ohio, plant; one a roller at Wheeling, W. Va., and one a roller on the blooming mill of the American Steel & Wire Works.

It is quite evident from the stenographic report that these men had on their company manners as they probably had on uncomfortable clothes; but there is a note of sincerity that runs through the remarks of all of them, that is both a high compliment to the success of the Steel Corporation's efforts for bettering conditions of its employees, and a decidedly hopeful sign of the times. A few quotations from the remarks of these five men will help to make these points clear.

Every stockholder in our plant owes a great deal to our chief clerk because he has taken upon himself a task to explain to the men time and time again the way they should buy stock and the benefits they would derive from it. * * * I have noticed for quite a number of years, even in big corporations, that to my mind there is a power in a working man that is buried. I am not speaking in reference to foremen or clerks or superintendents. I think that a corporation could devise ways whereby this very talent that is in the minds of working men that is not matured yet could be fetched out—instead of being looked at as a loss could be looked at as a profit. I am not speaking now for you to think that I am looking at this side of it—that is, to fetch these men out and make them foremen; God forbid. There is men in our plants and all of the plants that, if they had the chance, they have that within them that they could develop that would help all concerned * * * if this could be taken up by the corporations and some plan devised to encourage the men to bring out this * * * there would be a closer relation between the working man and the employer.

The officials there [at New Castle, Pa.] take a great interest in the sani-

tary conditions about the plant and all the vacant ground is cleaned up and beautiful parks are made out of them, and we have playgrounds for the children and they all come in there. There is no respecter of persons. And a trained nurse to look after those children and to teach them and to Americanize them and to bring them up in the way that children should be brought up in this American country. * * * And then the foremen are not abusive to men like they used to be in former days. The officials won't stand for it. * * * An old man with wrinkled brow and gray hair meets me on the street once in a while and takes me by the hand and says, "Well, I am on the pension roll." I say, "You ought to thank God for that." He is not a pauper. * * * This company keeps us from being paupers.

I wish I could respond to his [the chairman's] remarks in as nice language and in as nice way as he gave it to us. I can tell what the facts are and I will tell the truth. In the first place, we are receiving more money for the iron we are making than in any competing company that I know anything about. * * * We get paid for the gage that is put on the steel and we have the privilege of following it through to the customer and it is the gage that goes out. * * * I can honestly refer to my native state, Ohio, and our working men's compensation law, a good law no doubt. I believe it is doing good in many instances, but through misrepresentation it was made sufficiently radical until it has reacted to the detriment of the employees of the United States Steel Corporation. * * * The sanitary conditions have been so greatly improved that no man, I think, can describe the change that has been made. I might mention that I have worked in rolling mills where it was very undesirable; you could scarcely tell whether it was a swarm of bees or what it was. We have waded in mud, in rain and snow, and then if we would take our lunch and sit down, our biggest job was to keep the flies off. Now we do not have things like that. They have sanitary lockers and places to put our clothing; we have every convenience, far more than a great many of us perhaps have in our homes. * * * Look at our investment. Show me where I could have been helped to an investment of say \$2 a month, where I could invest that for 12 per cent. The Steel Corporation did not have to give that to me, gentlemen; they did not have to provide that investment for me. You will recollect that under the old system there was a different way of paying the men. There were two men and I happen to be one of these men, not at that time, however, but that is my job now—the heater and the roller; we were pretty well paid men. The rest of the men in the mill were not so well paid, but some of our critics seem to criticize as to the output of the mill. That has not necessarily increased the work of the men. It has reduced my wages, perhaps, and reduced the rollers' wages, but it has practically doubled every other man's wages in the mill. That is fair. The other men were doing the work before and a couple of us were getting the money; that is the truth of it. * * * My opinion is that the 12-hour man as a rule is not a hard working man at all. The facts are that the employer never established the 12-hour day. I helped to establish it and every working man who helped to build up the iron business helped to establish it and the refusal in many cases to grant a 12-hour day would have been sufficient cause for a walk-out many a time. * * * The 12-hour day is being eliminated very nicely now and I hear no objections.

Then there is our pension system; that is a good thing for us people. Take it, for instance, for myself—I have been working in the mill ever since I was 16 years old. I am now 52. I have got eight more years to go yet and then I can retire on a pension of 1 per cent. per year of service. That will amount to a great thing for me. * * * Take the buying of stock. I am still buying every year and I have every share that I have bought.

The sum and substance of the remarks of all these men was that they appreciated very fully the three things which the Steel Corporation has tried especially to give them—sanitary conditions, a liberal pension system and an opportunity to invest their savings at a very attractive figure.

NEW BOOKS

Manual of Statistics, 1914 Issue. Published by the Manual of Statistics Company, 20 Vesey street, New York. 1,110 pages. Price \$5.

The thirty-sixth annual issue of this manual is like its predecessors, a very comprehensive publication in very handy form. The book not only contains data in regard to railroad and industrial corporations which are usually contained in a manual of this kind, but also gives stock quotations for railroad, industrial, government, municipal and other securities, and shows also the capital surplus and earnings, together with the price of the stock of a very large number of banks. This inclusion of so great a variety of figures gives the Manual of Statistics a value in any statistical library which no other publication quite supplies.

Letters to the Editor

MR. HOWARD ON TRANSVERSE FISSURES

CHICAGO, Ill., June 20, 1914.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have read with much interest the recent report of the chief inspector of safety appliances and the engineer physicist of the Interstate Commerce Commission on the broken rail which caused the derailment of a New Haven passenger train near Westerly, R. I., on October 25, 1913, and which was abstracted in the *Railway Age Gazette* of June 19. In common with all students of the rail problem I have watched the increasing number of transverse fissures with much concern. For this reason, I regret to note the apparent incompleteness of this report in several essential details, especially in view of the sweeping conclusion Mr. Howard has drawn, and the importance which the public at large attaches to a report of this character.

Mr. Howard dwells at length on the comparison of the rail which failed with another rail from the same heat, which was also removed from the track and which failed to reveal any transverse fissures. He states that the failed rail was a C rail, but neglects to give the position of the other rail in the ingot, a very important detail when making a comparison of this sort. This second rail showed no transverse fissures and Mr. Howard draws the conclusion, by inference at least, that the traffic was responsible for the failure of the first rail. Had he examined the other rails in the same heat, as I am informed has been done by other parties, he would have found that at least two other rails showed the same interior transverse fissures, indicating that there was evidently some abnormal quality in the entire heat, and weakening if not entirely eliminating the argument that these fissures were entirely caused by the traffic.

Again, the report states that the failed rail shows nothing in its structure to indicate any abnormalities in mill practice. The chemical composition called for by the specifications provided for not over .04 per cent. phosphorus, while the composition reported to have been furnished in this heat was .033 phosphorus. The results of the chemical analysis of the broken rail showed .063 phosphorus, or nearly double that supposed to have been furnished. That certainly was not good mill practice and it is hard to reconcile Mr. Howard's conclusion with these figures.

It is not necessary to revert to other inconsistencies on this report, as this letter is not written in a spirit of undue criticism, but the writer believes it unfortunate that more of the details are not given, and that the conclusions are not more carefully drawn in view of the importance of this subject, and the universal desire to arrive at the real cause of this type of rail failures.

A STUDENT OF THE RAIL PROBLEM.

RAILWAY CONSTRUCTION IN INDIA.—The Secretary of State for India has given his sanction to a project for the construction by the government of His Highness the Nizam, of a line of meter gage railway from Secunderabad to Gadwal, a distance of 117 miles.

PHILIPPINE RAILWAY EXTENSION.—It is hoped that the Manila Railway will soon be completed to Baguio, the mountain capital. On this branch, the grading has been partly completed and the track has been laid up to the foot of the first rack grade where a cog road section begins. This latter section climbs a 14 per cent. grade for ten miles through country of magnificent scenery. On the entire branch there are to be five tunnels approximating a total length of .930 miles, of which the longest is .262 miles. One tunnel is practically completed. The heading has been driven through on three and a start made on the fifth. It is expected that the road will be ready for traffic in 1916.

Heat Transmission Tests on Steel Mail Car Section

Made at the University of Illinois to Determine the
Relative Efficiency of Various Types of Insulation

BY ARTHUR C. WILLARD

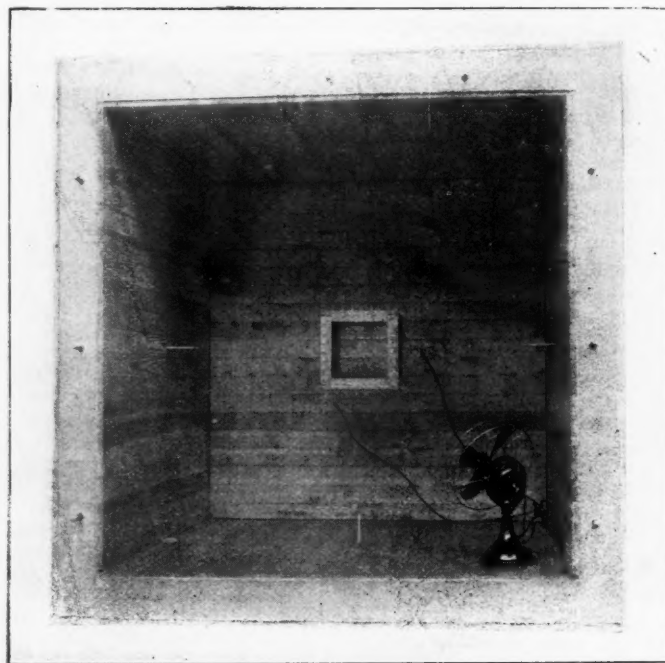
A limited number of tests have just been completed by the mechanical and railway engineering departments of the University of Illinois to determine the effectiveness of the present method of insulating the side walls of steel mail cars, as practiced by the New York Central Lines.

Object of Tests.—The specific object of these tests was: (1) the determination of the effect on the heat transmission of the car side of removing the insulation now inserted between the post section and the inside plate of the car; (2) the efficiency of the insulation as a whole as now applied to the steel cars with a $3\frac{3}{4}$ in. air space included, and (3) the efficiency of a method of insulation whereby no air space would exist in the walls, but instead the 4 in. space between the inside and outside plates would be filled with a granular or fibrous material which would render that space "dead" as far as convection currents were concerned.

Testing Apparatus and Test Specimen.—Fig. 4 shows the detail of a steel car side and its insulation. This is a horizontal section taken through one of the posts used to support and stiffen the inner and outer plates, which are of $1/16$ in. and $1/8$ in. steel respectively. It will be noted that the inner plate is separated from the foot of the post by a strip of agasote, or fiber board, $1/4$ in. thick. Fig. 4 shows two strips of agasote marked Pc No. 1 and Pc No. 2, with an air gap between. In the actual specimen the agasote was continuous from No. 1 to No. 2. The major portion of the insulation consists of salamander, or hair felt quilted covering, $1/4$ in. and $1/2$ in. thick, secured to the inner sides of the plates with spot welded clips and washers. The specimen tested was made up as a typical wall section measuring about 6 ft. 2 in. square.

The dimensions of this section were the same as one side of the standard heat transmission testing box installed in the mechanical engineering laboratory, the detail and general appearance of which may be seen by reference to Fig. 1. This box is

very similar to one constructed by Professor L. A. Harding at Pennsylvania State College. The walls are of 5 in. studding, and are sheathed inside and out with a single layer of $\frac{7}{8}$ in. tongue and groove siding, two layers of heavy building paper



Box sides of equal area and $6\frac{3}{4}$ in. thick are made of $\frac{7}{8}$ in. T and G on 5 in. studs covered each side with two layers of heavy building paper. Space between studs filled with granulated cork.

Fig. 1—Wood Box Ready to Receive Steel Car Side (Heating Coil, Fan, and Inside Air Thermometers all Shown)

TABLE OF RESULTS													
Test Nos.	Description of specimen	Period of pre-heating, in hrs.	Length of test, in hours.	Temperatures					B. t. u. per hr. per 1° difference in temperature per total trans. area	Coefficients of transmission = B. t. u. per hr. per 1° sq. ft., air temperatures		Remarks	
				Air inside of box	Air outside of box	Difference	Over post	Over center of panel		11	12		
1	2	3	4	5	6	7	8	9	10	11	12	13	
1, a	Standard box, all sides wood.....	20½	12½	157	73	84	....	....	18.48	.09712	} .09644 aver.	.....
1, b	Standard box, all sides wood.....	55	14	160.7	80.4	80.3	....	....	17.80	.09355		
1, c	Standard box, all sides wood.....	53	5½	160.6	85.7	74.9	....	....	18.64	.09795		
1, d	Standard box, all sides wood.....	140½	13½	142.3	69.2	73.1	....	....	18.48	.09713		
2, a	Standard box, one side steel as received.	19	11	162.9	75.5	87.4	99.3	88.4	27.99	.3846	} .3591 aver.	.6005 — .3591 × 100 = 40.2 per cent. insulation efficiency.	
2, b	Standard box, one side steel as received.	41½	13	163.4	73	90.5	97.8	86.3	26.37	.3325			
3, a	Standard box, one side steel, without Agasote under post.....	22	13	158	73	85	96.3	85.4	25.56	.3078	} .3176 aver.	.....
3, b	Standard box, one side steel, without Agasote under post.....	46½	14	156.9	71.9	85	95.6	84.7	25.58	.3080			
3, c	Standard box, one side steel, without Agasote under post.....	94	10½	158.3	78.8	79.5	101.5	91.3	26.48	.3369	} .6005 aver.	.....
4, a	Standard box, one side steel, with all insulation removed	19½	16½	161	84.5	76.5	112.7	109.5	35.83	.6324			
4, b	Standard box, one side steel, with all insulation removed	44	8	156.4	79.1	77.3	107.7	104.5	33.81	.5686			
5, a	Standard box, one side steel, filled with granulated cork only.....	17	14¾	155.9	82.2	73.7	103.4	90.1	24.18	.2642			
5, b	Standard box, one side steel, filled with granulated cork only.....	41	14	157.3	85.2	72.1	105.3	93.5	23.46	.2414	} .2528 aver.	.6005 — .2528 × 100 = 57.9 per cent. insulation efficiency.	
													.6005
WEIGHTS										AREAS			
Weight of steel side as received.....				590.0 lb.				Original box, 5 sides.....				158.6 sq. ft.	
Weight of original insulation.....				87.5 lb.				Original box, 1 side.....				31.7 sq. ft.	
Weight of uninsulated side.....				502.5 lb.				Composite box, 5 sides.....				164.0 sq. ft.	
Weight of granulated cork insulation.....				63.2 lb.				Composite box, 1 side (steel).....				31.64 sq. ft.	
Weight of granulated cork per cu. ft.....				6.0 lb.									

being laid against the studding on either side and the space between filled with granulated cork. One side of this box is made removable, and a suitable air-tight gasket is provided to make the joint secure and full when this side is replaced by a section of whatever wall material is to be tested. The box is further provided with a high resistance heating coil, a small

electric fan, and six long stem thermometers for reading inside air temperatures. Additional thermometers are also provided for reading both inside and outside surface temperatures as well as outside air temperatures.

Direct current at 440 volts is supplied to the coil, which consists of about 300 ft. of Advanced Brand No. 28 gage high re-

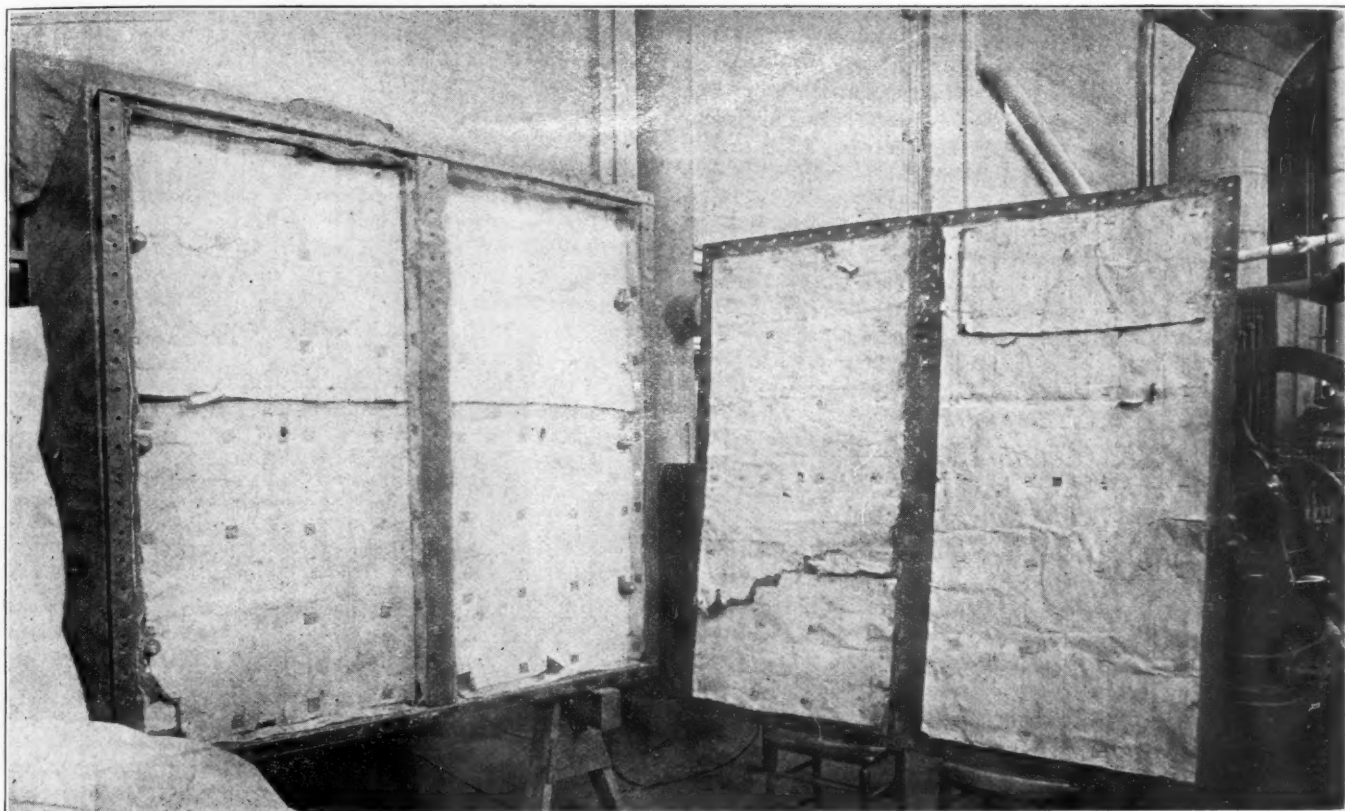
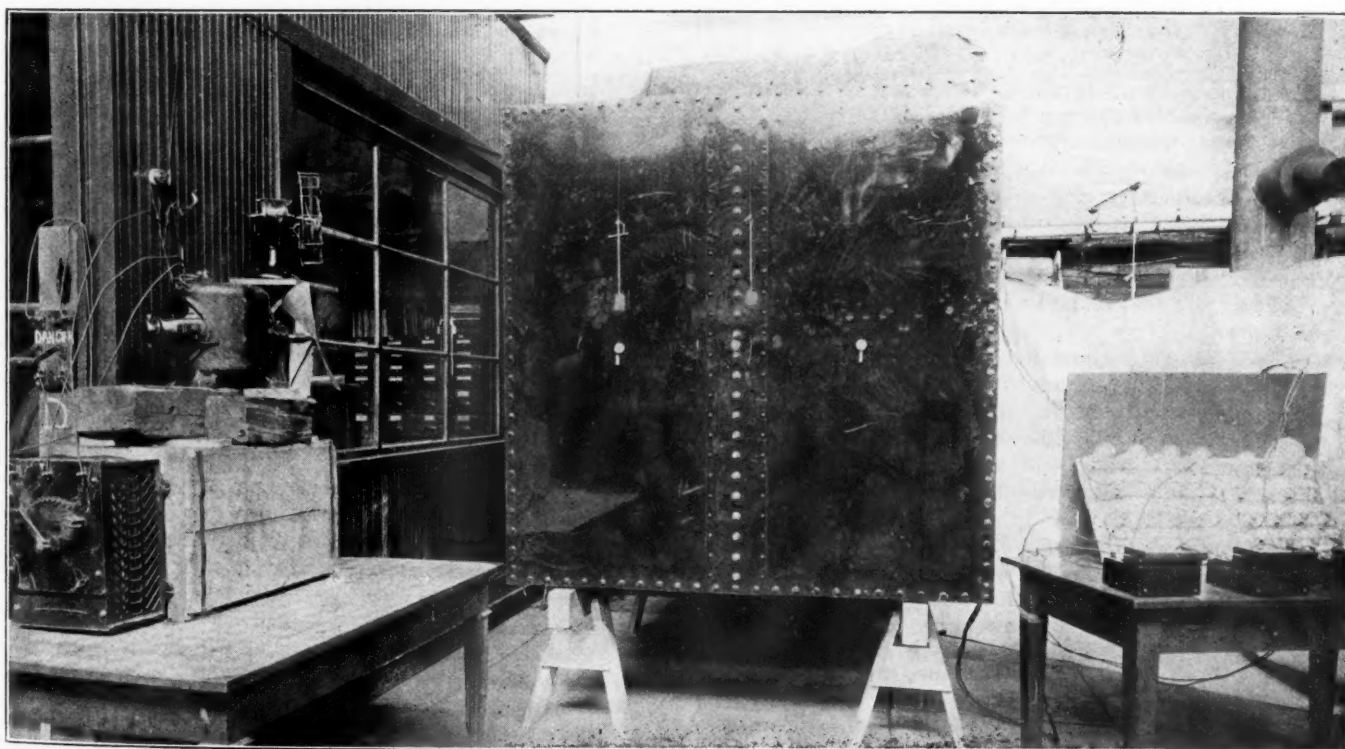


Fig. 2—Steel Car Side Attached to Box but with Outside Plate Removed, Showing Insulation as Received. Before Tests Were Run Insulation was Made as Tight and Continuous as Possible



Fans for moving air test at left, and lamp board and electrical instruments at right. These fans were not used during the five tests reported in this paper. During moving air test a screen is built around and in the same plane as the car side to keep the other five sides in still air.

Fig. 3—Box with Steel Car Side in Place Ready for Still Air Test

sistance wire, and a bank of lamps is used to vary the voltage and input of the coil. The fan is supplied from the same service feeders. Ammeters and voltmeters indicate the electric energy delivered to both coil and fan and the equivalent in B. t. u. per hour is the heat transmitted by the box to the outside air and surrounding objects. Reference to Figs. 1 and 3 will show the coil, fan and instrument table.

Tests and Results.—The tests reported were run in the still air of the laboratory, and were in general not less than 12 hours in duration, with a preheating period of from 24 to 48 or more hours. Air temperatures inside the box were maintained practically constant during the tests and the laboratory temperatures fluctuated but slightly, and always in the same direction for each test, so that the results are readily comparable. It is most essential that inside and outside temperatures be maintained absolutely constant if results are not to be used comparatively.

Reference to the "Table of Tests" will show the results from the five sets of tests, which it was necessary to run in order to accomplish the objects outlined in the second paragraph. In each case the coefficient of transmission—that is, the number of British thermal units transmitted by each square foot of the box or car side, per hour, per degree difference in temperature between inside and outside air—has been determined, and is used as the basis of comparison.

The determination of this coefficient for the original box is most important, as this value must be used in computing the subsequent coefficients for the steel side under each of the four conditions tested. For all sides of wood the average input in B. t. u. per hour is equal to the total average number of watts supplied to the coil and the fan per hour per degree difference multiplied by 3.412. This product divided by the average transmission area in square feet will then give the coefficient of transmission for the original box. This area for all tests is taken as the area of a surface half way between the inner and outer faces of the side walls.

The calculation of the coefficient of transmission when the removable side is replaced by a specimen for test is as follows:

$$K_s = \frac{H - A_w \times K_w}{A_s}, \text{ where}$$

K_s = coefficient of transmission for the car side.

H = total B. t. u. input to box per hour per degree difference in temperature, air inside to air outside of box.

A_w = average transmission area in square feet of five wooden sides.

K_w = coefficient of transmission for wooden sides as determined in tests of Set No. 1.

A_s = average transmission area in square feet of steel car side.

The most significant surface temperature readings were those taken over the center of post and over the center of the panel on the face of the outside plate of the steel side. (See Fig. 3, and columns 8 and 9 of the table.) It will be seen that the difference in these temperatures is approximately 11 deg. for tests with or without agasote insulation under the foot of the post. In the former case the difference is 11.2 deg. and in the latter 10.7 deg., the agasote insulation giving a slightly greater difference. On removing all insulation this difference became only 3.3 deg., but when cork was used as filling the difference rose to 12.6 deg., showing that the conductive effect of the steel post from inside to outside wall becomes more apparent as the efficiency of the entire insulation between the inside and outside plates increases.

Conclusions.—The necessity for insulating the foot of the post from direct contact with the inside plate arises from the fact that this post acts as a metallic conductor between the inside and outside plates. Surface temperature readings on the outside plate showed that the plate over the post is always warmer than at any other place, and hence the heat loss from this area must be greater than for an equal area taken at any other location on the surface of the car side.

It must be remembered, however, that this area is only about $3/74$ of the whole area, or 4 per cent.; and on the assumption that the heat loss will be increased directly as the difference between the surface temperature and the outside air temperatures

the effect of this higher temperature at the post would only amount to an increase of $4 \times 24.3/13.1 = 7.4$ per cent. for the entire side, as compared with a side having the temperatures over the post and over the panel the same.

Since the presence or absence of the agasote had little effect on the difference between the over post and over panel temperatures, the heat loss will naturally not be appreciably affected by its removal. The probable reason for the ineffectiveness of the agasote is due to the fact that the foot of the post is secured to the inside plate by $3/8$ in. bolts or rivets passing through the agasote on 3 in. centers, so that metallic conduction of heat can occur in any event. The conductive capacity of the bolts is sufficiently great to transmit all the heat that the outside plate can dissipate to the outside air at a temperature about 11 deg. above the panel surface whether the agasote is present or not.

It is apparent then, that so far as the whole area of the specimen car side is concerned the effect of using a $1/4$ -in. layer of agasote under the post is of little or no advantage, the tests in groups 2 and 3 in all cases but one (see runs No. 2 b and No. 3 c) showing to the contrary.

The efficiency of the present method of insulation is 40.2 per cent.; that is, the insulation as installed in the original specimen

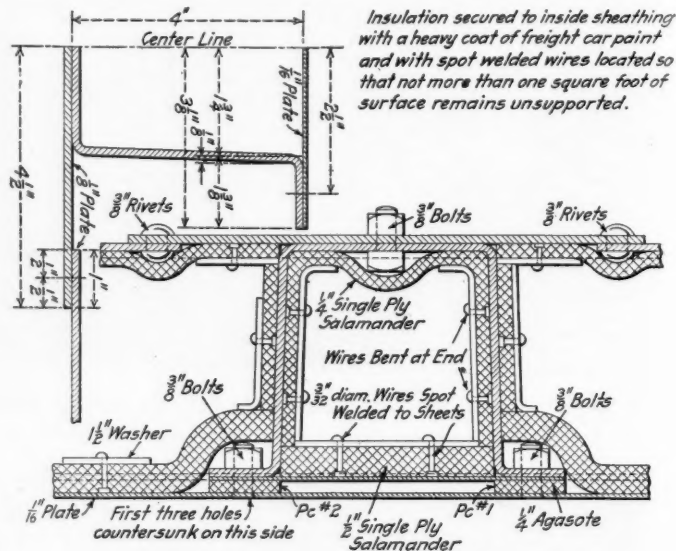


Fig. 4—Section of Steel Mail Car Showing Insulation

cut down the heat transmission of the uninsulated specimen by only 40.2 per cent.

The efficiency of the cork insulation as compared with the uninsulated specimen was 57.9 per cent., so that with an absolutely dead air space and cork filling a gain of 44 per cent. is made over the present method of insulation.

The cork insulation weighed 63.2 lb. and the original insulation 87.5 lb., so that the saving in weight is about 28 per cent.

It must be distinctly understood that these tests were limited in number, and were of a preliminary nature. A. R. Ayers, general mechanical engineer of the New York Central Lines West, furnished the test specimen, on the suggestion of Professor E. C. Schmidt of the Railway Engineering Department that the heat transmission box could be used for securing the comparative data outlined above. Especial credit is due G. E. Jaquet for his careful determination of the data taken during the tests, and the compilation of results.

THE HANKOW-ICHANG RAILWAY OF CHINA.—It is stated that it has been decided that the terminus of the Hankow-Ichang Railway will be at Hankow and not at Kwangsi on the Peking-Hankow line. It is possible that the route may run parallel with the Peking line as far as Siaokan, but that question has yet to be decided. The engineers also have not decided whether the railway is to cross the river Han nor have they come to a decision as to the route of the railway beyond Ichang.

The Intermountain Freight Rate Decision

Supreme Court of the United States Sustains Amended Fourth Section and Approves Zone Freight Rates

The Supreme Court, in a decision handed down at Washington June 22, has sustained the order of the Interstate Commission reducing freight rates from the Eastern and Central states to points in Nevada, Idaho, Arizona and elsewhere in the "intermountain" region, and has approved as constitutional the act of Congress conferring on the Interstate Commerce Commission extensive powers in the administration of the long and short haul section of the law.

The decision was delivered by Chief Justice White, and was unanimous. The Interstate Commerce Commission has full authority to fix blanket or zone rates, and the Commerce Court is reversed. That court held that the commission could only fix individual rates. The case is remanded to the proper district court with directions to dismiss the bill for want of equity.

The order of the commission* required that rates to intermountain points from Missouri river territory should not be higher than from that territory through to the Pacific coast; that from Chicago territory they might be 7 per cent. above rates to the coast; from Pittsburgh-Buffalo territory, 15 per cent. higher, and from New York and trunk line territory 25 per cent. higher.

The following are the main points of the Supreme Court's decision:

"The railroads declared that they must keep through rates to the Pacific coast cities low on account of the necessity of meeting water competition, and also that the long and short haul clause was unconstitutional in that it delegated legislative powers to the commission.

"We shall seek to confine our statement to matters which are essential to the decision of the case. The provisions of section 4 of the act to regulate commerce were materially amended by the act of June 18, 1910, the allowance for dissimilar conditions being left out. Following the form prescribed by the commission after the amendment in question, the seventeen carriers who are appellees on this record made to the Interstate Commerce Commission their application for relief from the provisions of the fourth section.

"The tariffs covered the whole territory from the Atlantic seaboard to the Pacific coast and the Gulf of Mexico, including all interior points, and embracing practically the entire country, and the petition asked for authority to continue rates from the Atlantic seaboard to the Pacific coast, and from the Pacific coast to the Atlantic seaboard, and to and from certain interior points, lower than rates concurrently in effect, from and to intermediate points.

"It was stated in the petition:

"This application is based upon the desire of the interested carriers to continue the present method of making rates lower at the more distant points than at intermediate points; such lower rates being necessary by reason of competition of various water carriers and of carriers partly by water and partly by rail operating from Pacific coast ports to Atlantic seaboard ports, competition of various water carriers operating to foreign countries from Pacific coast ports and competition of the products of foreign countries with the products of the Pacific coast; competition of the products of Pacific coast territory with the products of other sections of the country; competition of Canadian rail carriers not subject to the Interstate Commerce Act; competition of the products of Canada moving by Canadian carriers with the products of the United States; rates established via the shorter or more direct routes, but applied also via the longer or more circuitous routes."

"After full hearing the commission refused to grant unquali-

fiedly the prayer of the petition, but entered an order permitting in some respects a lower charge for the longer haul to the Pacific coast than was asked for intermediate points, provided a proportionate relation was maintained between the lower rate for the longer haul to the Pacific coast, and the higher rate to the intermediate points, the proportion to be upon the basis of percentages which were fixed.

"For the purposes of the order in question, the commission in substance adopted a division of the entire territory into separate zones, which division had been resorted to by the carriers for the purpose of the establishment of the rates in relation to which the petition was filed.

"Refusing to comply with this order, the carriers commenced proceedings in the Commerce Court. . . . An interlocutory injunction was ordered. . . . A final decree was entered and appealed from, that appeal being No. 162. . . . All the contentions which the assignments of error involve, and every argument advanced . . . are all reducible to the following propositions:

"(a) The absolute want of power of the court below to deal with the subject involved in the complaint because controversies concerning the fourth section of the act to regulate commerce of the nature here presented were by an express statutory provision excluded from the cognizance of the court below.

"(b) That even if this be not the case the action of the commission which was complained of was purely negative and therefore not within the cognizance of the court because not inherently justifiable.

"(c) That, correctly interpreting the fourth section, the order made by the commission was absolutely void because wholly beyond the scope of any power conferred by the fourth section as amended.

"(d) That even if in some respects the order of the commission was within the reach of its statutory power there was intermingled in the order such an exertion of authority not delegated as to cause the whole order to be void.

"(e) That the order of the commission was void even if the fourth section be interpreted as conferring the authority which the commission exerted, since under that assumption the fourth section as amended was repugnant to the constitution.

"All the propositions, even including the jurisdictional ones, are concerned with and depend upon the construction of the fourth section as amended, and we proceed to consider and pass upon that subject and every other question in the case under four separate headings.

"1. The meaning of the statute.

"2. Its constitutionality.

"3. The jurisdiction of the court.

"4. The validity of the order in the light of the statute as interpreted.

"1. The meaning of the statute:

" . . . Before considering the amended text, we state briefly some of the more important requirements of the section before amendment and the underlying conceptions of private right, of public duty and policy which is embodied, because to do so will go a long way to remove any doubt as to the amended text and will, moreover, serve to demonstrate the intent of the legislative mind in enacting the amendment.

"Almost immediately after the adoption of the act to regulate commerce in 1887, the Interstate Commerce Commission in considering the meaning of the law and the scope of the duties imposed on the commission in enforcing it, reached the conclusion that the words 'under substantially similar circumstances and conditions' of the fourth section dominated the long and short

*See *Railway Age Gazette*, July 28, 1911, and September 22, 1911.

haul clause and empowered carriers to primarily determine the existence of the required dissimilarity of circumstances and conditions and consequently to exact in the event of such difference a lesser charge for the longer than was exacted for the shorter haul and that competition which materially affected the rate of carriage to a particular point was a similar circumstance and condition within the meaning of the act. . . .

"In considering the act comprehensively it was pointed out that the generic provisions against preference and discrimination expressed in the second and third sections of the act were all-embracing and were therefore operative upon the fourth section as well as upon all other provisions of the act. But it was pointed out that where within the purview of the fourth section it had lawfully resulted that the lesser rate was charged for a longer than was exacted for a shorter haul, such exaction, being authorized, could not be a preference or discrimination, and therefore illegal.

"These comprehensive views, announced at the inception as a matter of administrative construction, were subsequently sustained by many decisions of this court. We observe, moreover, that in addition, it came to be settled that where competitive conditions authorized carriers to lower their rates to a particular place, the right to meet the competition by lowering rates to such place was not confined to shipments made from the point of origin of the competition, but empowered all carriers in the interest of freedom of commerce and to afford enlarged opportunity to shippers to accept, if they chose to do so, shipments to such competitive points at lower rates than their general tariff rates; a right which came aptly to be described as 'market competition,' because the practice served to enlarge markets and develop the freedom of traffic and intercourse. It is to be observed, however, that the right thus conceded was not absolute, because its exercise was only permitted provided the rates were not so lowered as to be non-remunerative, and thereby cast an unnecessary burden upon other shippers.

"As the statute as thus construed imposed no obligation to carry to the competitive point at a rate which was less than a reasonable one, it is obvious that the statute regarded the rights of private ownership and sought to impose no duty conflicting therewith.

"It is also equally clear that in permitting the carrier to judge primarily of the competitive conditions and to meet them at election, the statute lodged in the carrier the right to exercise a primary judgment concerning a matter of public concern broader than the mere question of the duty of a carrier to carry for a reasonable rate on the one hand and of the right of the shipper on the other to compel carriage at such rate, since the power of primary judgment which the statute conferred concerned in a broad sense the general public interest with reference to both persons and places, considerations all of which, therefore, in their ultimate aspects came within the competency of the legislative regulation.

"It was apparent the power thus conferred was primary, not absolute, since its exertion by the carrier was made by the statute the subject both of administrative control and ultimate judicial review. And the establishment of such control in and of itself serves to make manifest the public nature of the attribute conferred upon the carrier by the original fourth section. Indeed, that insofar as the statute empowered the carrier to judge as to the dissimilarity of circumstances and conditions for the purpose of relief from the long and short haul clause it but gave the carrier the power to exert a judgment as to things public was long since pointed out by this court.

"With the light afforded by the statements just made we come to consider the amendment. It is certain that the fundamental change which it makes is the omission of the substantially similar circumstances and conditions clause, thereby leaving the long and short haul clause in a sense unqualified except in so far as the section gives the right to the carrier to apply to the commission for authority 'to charge less for longer than for shorter distances for the transportation of persons or property,' and gives

the commission authority from time to time 'to prescribe the extent to which such designated common carrier may be relieved from the operation of this section.'

"From the failure to insert any word in the amendment tending to exclude the operation of competition as adequate under proper circumstances to justify the awarding of relief from the long and short haul clause, and there being nothing which minimizes or changes the application of the preference and discrimination clauses of the second and third sections, it follows that in substance the amendment intrinsically states no new rule or principle, but simply shifts the powers conferred by the section as it originally stood; that is, it takes from the carriers the deposit of public power previously lodged in them and vests it in the commission as a primary instead of a reviewing function.

"In other words, the elements of judgment or, so to speak, the system of law by which judgment is to be controlled remains unchanged; but a different tribunal is created for the enforcement of the existing law. This being true, as we think it plainly is, the situation under the amendment is this: Power in the carrier primarily to meet competitive conditions in any point of view by charging a lesser rate for a longer than a shorter haul has ceased to exist, because to do so in the absence of some authority would not only be inimical to the provision of the fourth section, but would be in conflict with the preference and discrimination clauses of the second and third sections.

"But while the public power, so to speak, previously lodged in the carrier, is thus withdrawn and reposed in the commission, the right of carriers to seek and obtain under authorized circumstances the sanction of the commission to charge a higher rate for a longer than for a shorter haul because of competition or for other adequate reasons, is expressly preserved; and if not, is in any event by necessary implication granted. . . .

"2. The alleged repugnancy of the section, as amended, to the Constitution. . . . The argument is that the statute, as correctly construed, is but a delegation to the commission of legislative power which Congress was incompetent to make. But the contention is without merit. *Field vs. Clark*, 143 U. S., 649; *Buttfield vs. Stranahan*, 192 U. S., 470; *Union Bridge Co. vs. United States*, 206 U. S. 364; *United States vs. Heinszen*, 206 U. S. 370; *St. Louis & San Francisco vs. Taylor*, 210 U. S. 281; *Monongahela Bridge Co. vs. United States*, 216 U. S. 177.

"We do not stop to review these cases because the mere statement of the contention in the light of its environment suffices to destroy it. . . . The argument as applied to the case before us is this: That the authority in question was validly delegated so long as it was lodged in carriers, but ceased to be susceptible of delegation the instant it was taken from the carriers for the purpose of being lodged in a public administrative body. Indeed, when it is considered that in last analysis the argument is advanced to sustain the right of carriers to exert the public power which it is insisted is not susceptible of delegation, it is apparent that the contention is self-contradictory since it reduces itself to an effort to sustain the right to delegate a power by contending that the power is not capable of being delegated.

"In addition, however, before passing from the proposition we observe that when rightly appreciated the contention but challenges every decided case since the passage of the act to regulate commerce in 1887, involving the rightfulness of the exertion by a carrier of the power to meet competition as a means of being relieved from the long and short clause of the fourth section before its amendment.

"While what we have already said answers it, because of its importance, we notice another contention. As the power of carriers to meet competition and the relation of that right to non-competitive places may concern the fortunes of numberless individuals and the progress and development of many communities, it is said, to permit authority to be exerted concerning the subject without definite rules for its exercise will be to destroy the rights of persons and communities.

"This danger, the argument proceeds, is not obviated by de-

declaring that the provisions of the second and third section as to undue preference and discrimination apply to the fourth section, since without a definition of what constitutes undue preference and discrimination, no definite rule of law is established, but whim, caprice, or favor will in the nature of things control the power exerted. And it is argued that this view is not here urged as the mere result of conjecture since in the report of the commission in this case it was declared in unequivocal terms as the basis of the order entered that the statute vested in the commission a wide and undefined discretion by virtue of which it became its duty to see to it that communities and individuals obtained fair opportunities, that discord was allayed, and commercial justice everywhere given full play.

"Let it be conceded that the language relied upon would have the far reaching significance attributed to it if separated from its context, we think when it is read in connection with the report of which it but forms a part, and moreover when it is elucidated by the action taken by the commission, there is no substantial ground for holding that by the language referred to it was entitled to declare that the fourth section as amended conferred the uncontrolled exuberance of vague and destructive powers which it is now insisted was intended to be claimed.

"In any event, however, we must be governed by the statute and its plain meaning. After all has been said the provisions as to undue preference and discrimination, while involving, of course, a certain latitude of judgment and discretion, are no more undefined or uncertain in the fourth section as amended than they have been from the beginning, and therefore the argument comes once more to the complaint that, because public powers have been transferred from the carriers to the commission, the wrongs suggested will arise. Accurately test this final result of the argument, and it is clear that it exclusively rests upon convictions concerning the impolicy of having taken rate making power from carriers, intimately and practically acquainted as they are with the complex factors entering into rate making, and moreover impelled to equality of treatment as they must be by the law of self-interest, operating upon them as a necessary result of the economic forces to which they are subjected, and having lodged the power in an official administrative body, which in the nature of things must act, however, conscientiously, from conceptions based upon a more theoretical and less practical point of view.

"But this does not involve a grievance based upon the construction or application of the fourth section as amended, but upon the wisdom of the legislative judgment which is brought into play in adopting the amendment, a subject with which we have nothing in the world to do. It is said in the argument on behalf of one of the carriers that as in substance and effect the duty is imposed upon the commission in a proper case to refuse an application, therefore, the law is void, because in such a contingency the statute would amount to an imperative enforcement of the long and short haul clause, and would be repugnant to the constitution.

"It is conceded in the argument that it has been directly decided by this court that a general enforcement of the long and short haul clause would not be repugnant to the constitution (*L. & N. vs. Kentucky*, 183 U. S. 503), but we are asked to reconsider and overrule the case and thus correct the error which was manifested in deciding it. But we are not in the remotest degree inclined to enter into this inquiry; not only because of the reasons which were stated in the case itself, but also because of those already expounded in this opinion; and for an additional reason, which is that the contention by necessary implication assails the numerous cases which from the enactment of the act to regulate commerce down to the present time have involved the adequacy of the conditions advanced by carriers for justifying their departure from the long and short haul clause.

"We say this because the controversies which the many cases referred to, considered and decided, by a necessary

postulate involved an assertion of the validity of the legislative power to apply and enforce the long and short haul clause. If this were not the case all the issues presented in the numerous cases would have been merely but moot. . . .

"3. The jurisdiction of the court.

"The argument on this subject is twofold: (a) That as the act creating the Commerce Court endowed it only with the jurisdiction now possessed by the circuit courts and provided that nothing should be construed as enlarging the jurisdiction possessed by the circuit courts that is hereby transferred to and vested in the commerce court, and as new powers were created by the subsequent amendment of the fourth section, therefore the commerce court had no jurisdiction.

"But we pass any extended discussion of the proposition because it is completely disposed of by the construction which we have given to the amended section since that construction makes it clear that the effect of the amended fourth section was not to create new powers theretofore non-existing, but simply to re-distribute the powers already existing, and which were then subject to review. The argument affords another manifestation of the tendency to which we have already directed attention in this case to seek to maintain and aggrandize a power by insisting upon propositions which, if they were accepted, would raise the gravest question as to the constitutional validity of the asserted power, a question which we need not at all consider in view of the want of foundation for the exercise of the power claimed in the light of the plain meaning of the act to the contrary which we have already pointed out.

"(b) The second contention as to jurisdiction yet further affords an illustration of the same mental attitude, since it rests upon the assumption that the order of the commission refusing to grant the request of the carrier made under the fourth section was purely negative, and hence was not subject to judicial inquiry. The contention, therefore, presupposes that the power which from the beginning has been the subject of judicial review by the mere fact of its transfer to the commission was made arbitrary. Besides, the proposition disregards the fact that the right to petition the commission conferred by the statute is positive; and while the refusal to grant it may be in one sense negative, in another and broader view it is affirmative since it refuses that which the statute in affirmative terms declares shall be granted if only the conditions which the statute provides are found to exist.

"It is, of course, true as pointed out in *Interstate Commerce Commission vs. Illinois Central*, 215 U. S., 452, 470, and since repeatedly applied, that findings of fact made by the commission within the scope of its administrative duties must be accepted in case of judicial review; but that doctrine, as was also pointed out, does not relieve the courts, in a proper case, from determining whether the constitution has been violated or whether statutory powers conferred have been transcended or have been exercised in such an arbitrary way as to amount to the exertion of authority not given, doctrines which but express the elementary principle that an investiture of a public body with discretion does not imply the right to abuse, but on the contrary carries with it as a necessary incident the command that the limits of a sound discretion be not transcended, which by necessary implication carries with it the existence of judicial power to correct wrongs done by such excess.

"And without pausing to particularly notice it we observe, in passing, that what has just been said is adequate to meet the contention that as violations of the fourth section were made criminal, no power existed to enjoin an order of the commission made under that section, because the consequence would be to enjoin criminal prosecution. The right which, as we have seen, the act gives to test the validity of orders rendered under the fourth section is not to be

destroyed by a reference to a provision of that section. The two must be harmoniously enforced.

"4. The validity of the order in the light of the statute as interpreted.

"The main insistence is that there was no power, after recognizing the existence of competition and the right to charge a lesser rate to the competitive point than to intermediate points, to do more than fix a reasonable rate to the intermediate points; that is to say, that, under the power transferred to it by the section as amended, the commission was limited to ascertaining the existence of competition and to authorizing the carrier to meet it, without any authority to do more than exercise its general powers concerning the reasonableness of rates at all points. But this proposition is directly in conflict with the statute as we have construed it, and with the plain purpose and intent manifested by its enactment. To uphold the proposition it would be necessary to say that the powers which were essential to the vivification and beneficial realization of the authority transferred had evaporated in the process of transfer, and hence that the power perished as a result of the act by which it was conferred.

"As the prime object of the transfer was to vest the commission, within the scope of the discretion imposed and subject in the nature of things to the limitations arising from the character of the duty enacted and flowing from the other provisions of the act, with authority to consider competitive conditions and their relation to persons and places, necessarily there went with the power the right to do that by which alone it could be exerted, and therefore a consideration of the one and the other; and the establishment of the basis by percentages was within the power granted.

"As will be seen by the order, and as we have already said, for the purpose of the percentages, established zones of influence were adopted, and the percentages fixed as to such zones varied or fluctuated upon the basis of the influence of the competition in the designated areas. As we have pointed out, though somewhat modified, the zones as thus selected by the commission, were in substance the same as those previously fixed by the carriers as the basis of the rate making which was included in the tariffs which were under investigation, and therefore we may put that subject out of view.

"Indeed, except as to questions of power, there is no contention in the argument as to the inequality of the zones or percentages or as to any undue preference or discrimination resulting from the action taken. But be this as it may, in view of the findings of the commission as to the system of rates prevailing in the tariffs which were before it, of the inequalities and burdens engendered by such system, of the possible aggrandizement, unnaturally beyond the limits produced by competition in favor of the competitive points, and against other points by the tariff in question, facts which we accept and which indeed are unchallenged, we see no ground for saying that the order was not sustained by the facts upon which it was based, or that it exceeded the powers which the statute conferred, or transcended the limits of sound legal discretion which it lodged in the commission when acting upon the subject before it.

"It results that the Commerce Court, in enjoining the order of the commission, was wrong; and its decree to that end must, therefore, be reversed and the case be remanded to the proper district court, with directions to dismiss the bill for want of equity."

RAILWAY CONSTRUCTION IN INDIA.—The Secretary of State in India has sanctioned the construction of a line of railway of five foot six inch gage from Jind station on the southern Punjab Railway to Panipat station on the Delhi-Umballa-Kalka Railway, a distance of about 43.6 miles. The project will be known as the Jind-Panipat Railway.

GASOLENE LOCOMOTIVE

Baldwin gasolene locomotives, built in accordance with patents granted to A. H. Ehle, have now been in service for several years in light industrial and contractors' service. The success of these machines is attributed largely to the fact that they follow steam locomotive design where practicable, and embody features which have proved successful in this class of power.

The illustration shows a Baldwin gasolene locomotive recently built for the Georgia Coast & Piedmont. This engine is used in light switching and road service, and was designed for handling a load of 30 tons over grades of 0.5 per cent. and curves of 300 ft. radius. In preliminary trials, it handled approximately twice this tonnage. The track gage is standard, and the locomotive has a nominal speed of 6 miles per hour on low gear and 12 miles per hour on high gear. The hauling capacity given above applies to the latter speed.

This locomotive is propelled by a four-cylinder, four-cycle, water cooled engine, of 50 horse power nominal capacity. The power is transmitted to the wheels through a system of shafting, gearing and side rods. The engine and transmission are covered by a hood, on top of which the gasolene tank is placed. This tank has a capacity for 30 gal., an amount sufficient to propel the locomotive a distance of 50 or 60 miles, under average working conditions.

This locomotive is required to handle trunk line rolling stock,



Gasolene Driven Locomotive

and its equipment has received special attention. An important feature is a self starter for the main engine. This is driven by an electric motor, which receives its current from a storage battery. The latter is automatically charged by a generator driven from the main engine. This battery also furnishes current for the headlights and cab lights.

The appearance of the locomotive is strongly suggestive of steam practice. The effect is more pronounced because of the position of the muffler, which looks like a smoke stack. This device renders the locomotive almost noiseless in operation.

These machines possess special advantages for light switching and industrial service. They are self-contained, like a steam locomotive; are reliable and simple in operation, and can be easily handled by one man. An advantage which is most apparent in intermittent service, is that they consume no power while standing idle. Here the self-starter is particularly effective, as when the locomotive is idle for only short periods of time, the engine can be stopped and started without labor on the part of the operator.

The principal dimensions of the Georgia Coast & Piedmont locomotives are as follows:

Wheel base	4 ft. 9 in.
Wheels, diameter	30 in.
Journals	3¼ in. by 4½ in.
Width	6 ft. 6 in.
Height to top of cab	8 ft. 6 in.
Length	13 ft. 9 in.
Weight, estimated	14,000 lb.

Economical Train Loading for a Given Territory

An Empirical Method for Determining Train Loading Tested on Coast Line Division of Southern Pacific

By ALBERT G. MOTT

Student in Operation, Southern Pacific

The production of ton miles is accomplished by collecting tons into train loads and hauling the train loads the necessary miles to reach their destination. It is, then necessary to base the study of the time taken to produce the ton mile and the cost of producing it upon the performance of train loads.

Now, the cost of operating a railroad as applied to a particular train may be divided into three classes, as follows:

Class 1.—Those expenses that are entirely independent of the running of any particular train. Such expenses are, interest, depreciation, and other so-called fixed charges, must of the general expenses, a portion of maintenance expenses and other such items.

Class 2.—Those expenses which depend partly or entirely upon

freight moved are independent of the train load, but vary inversely in proportion to the total number of ton miles produced.

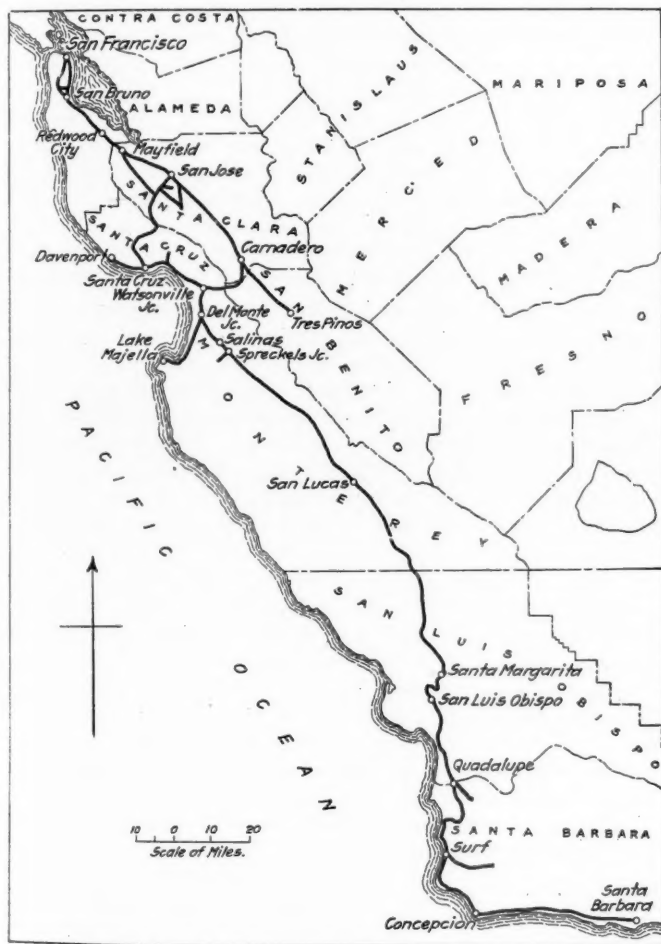
The expenses of the second class per ton mile may, and probably do, vary in some relation to the train load, but since they cannot be definitely distributed to individual trains, it is impossible to determine accurately what this relation is. Unfortunately, this is particularly true for ordinary maintenance of equipment expenses, and for such an item the time-honored comparative statement, with all its faults and limitations, is the only method yet devised for indicating the effectiveness of the expenditure.

The expenses of the third class per ton mile vary in some relation to the train load, and this relation may be reasonably and definitely determined by the method developed for this analysis and herein described. This analysis undertakes to determine the relation of the engine load to the cost of fuel per ton mile, the cost of train crews per ton mile, and the cost of engine crews per ton mile for through freight train service only.

The territory chosen to make these preliminary analyses (for this whole investigation is of more or less a preliminary nature, undertaken principally to suggest what can be done) was two typical freight subdivisions on the Coast division of the Southern Pacific, namely, the Watsonville Junction-San Luis Obispo subdivision, and the San Luis Obispo-Santa Barbara subdivision. The accompanying table of physical characteristics, together with the attached condensed profile charts, quite clearly indicate the nature of the territory so far as it concerns this discussion. It will be noted that on the Watsonville Junction-San Luis Obispo subdivision there is a gradual but reasonably steady climb (eastbound) all the way from Watsonville Junction to Santa Margarita, a distance of 135 miles. The helper grade of 2.2 per cent., then rises for four miles and falls again for thirteen miles. This territory allows a fully loaded engine to work at full capacity for over three-fourths of the total distance eastbound, and nearly half the total distance westbound. On the other hand, the San Luis Obispo-Santa Barbara subdivision is a series of comparatively short accents and descents, with a somewhat greater ruling grade than on the non-helper territory of the Watsonville Junction-San Luis Obispo subdivision, with the result that in either direction a fully loaded engine will work to capacity only about one-third of the total distance.

Data were collected from the actual performance of every through freight train run over each of these subdivisions in each direction for the period from November 13, 1913, to January 15, 1914, being a total period of 64 days. This data was collected on cards, a card being used for the record of each train. The purpose of putting the record on individual cards was to make it possible to readily group all trains conforming to any particular condition together, to better compare one group with another.

The following items were recorded for each train: Train number, date, direction, character of load (whether manifest, drag, stock train, perishable, etc.), name of conductor, name of engineer, road engine number, helper engine numbers, initial station, time called to leave, time of departure, terminal station, time of arrival, total time on the road, amount of delay segregated as to causes, actual running time, train load in Ms (thousands of pounds), to each important point of breaking tonnage, number of cars, the M miles (thousand-pound-miles) handled on trip, the potential M miles (thousand-pound-miles) rating of the power used, per cent. of train load to engine rating over

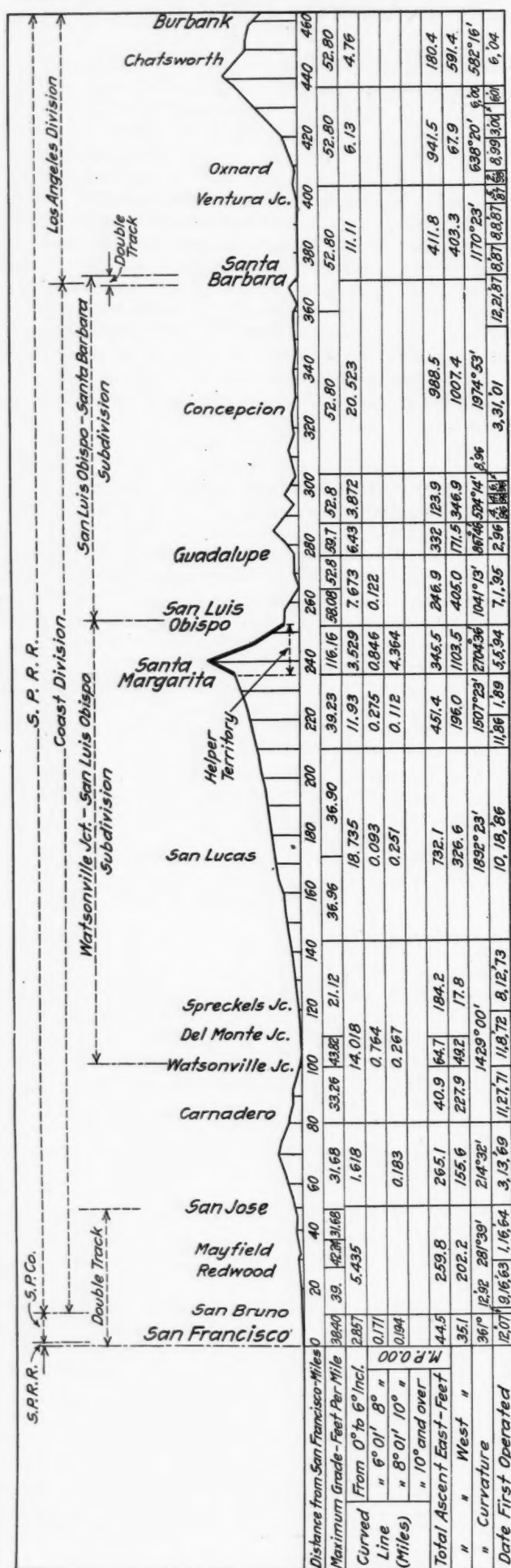


The Coast Line Division of the Southern Pacific

the running of individual trains, but which cannot be accurately measured for or logically distributed to any particular train. Such expenses are rail renewals and locomotive repairs, which, made necessary by the accumulative effect of individual trains, cannot be attributed definitely to any particular train.

Class 3.—Those expenses which depend upon the running of individual trains and can be accurately measured for each train. Important expenses of this class are, cost of engine crews, cost of train crews and cost of fuel.

Obviously, the expenses of the first class per ton mile of



Profile of the Coast Line Division of the Southern Pacific

subdivision, the amount of fuel oil in tender at beginning of trip, the amount of fuel oil in tender at end of trip, the amount of fuel oil taken en route, the total amount of fuel oil used on trip, the total cost of fuel oil used on trip, the cost of train crews per trip, the cost of engine crews for trip, the unit cost of fuel, unit cost of train crews and the unit cost of engine crews.

The unit is in all cases taken as one hundred gross ton miles, and by gross tons is meant weight of cars and contents. The weight of engine and tender is not included.

From the data thus obtained the attached diagrams were plotted. The curves indicate many interesting features of train operation. In the first place, it is evident that the operating characteristics are different for the two subdivisions, and even different for the opposite directions on the same subdivision. This suggests that only in a most general way can definite conclusions be applied uniformly to all kinds of territory. To obtain the most effective results, each subdivision must be individually studied, local conclusions drawn and suitable rules applied to each terminal and subdivision to obtain the most economical operation.

Taking the curves individually and turning to the westbound train load characteristics for the San Luis Obispo-Santa Barbara subdivision (Fig. 1) we find: that the unit cost decreases from infinity at no-load to a minimum or 1.66 cent for fuel, 0.82 cent for trainmen, and 0.70 cent for enginemen, for a fully loaded engine. The time on the road curve indicates an increase from 4.1 hours between terminals for a light engine to 5.7 hours for a train loaded to 80 per cent. of the engine's rating, and practically no further increase in the time on the road for any further loading of the train. This was possibly the most significant and unexpected feature brought out by the whole investigation. It is proper to call attention to the fact that these data were collected from train sheets, fuel records, delay reports and other reports without it being known to the men who were operating the trains that any special analysis was being made, thus excluding the possibility of special loading and exceptional running for the benefit of the data. It is therefore apparent that this set of curves, plotted from the performance of 333 through freight train movements, is not an expression of what trains theoretically could do, or ideally might be expected to do, but is a portrayal of what a large number of trains actually did do in this particular territory when handled by crews in a normal manner.

Analyzing a little further to determine the reason for this unexpected condition, it is found (see Fig. 5) that although delays due to meeting and being passed by trains increase somewhat in proportion to the train load, this delay is more than counteracted by the less switching required of trains heavily loaded. Referring to the table of physical characteristics, the real reason is found, namely, that since the territory is of an undulating grade the proportion of mileage over which an engine loaded to full rating is limited in speed by time table restrictions is almost two-thirds of the total distance, while power requirements limit speed for only one-third of the distance. It therefore appears that a light train has a speed advantage over a heavy train for only a third of the time actually in motion, and not at all when not in motion. The curve indicates that the practical effect of this advantage is quite negligible except for very light loads.

It therefore appears that to obtain the most economical results westbound on the San Luis Obispo-Santa Barbara subdivision, all trains out of Santa Barbara should be loaded to full rating of the power, generally a reserve of dead freight being kept at Santa Barbara to fill out important trains if possible without undue terminal delay. If, on the other hand, a fast run is imperative for some special shipment, such as an important stock train or a fruit consignment, the other extreme should be taken and not much more than a third of a train should be given the engine.

Turning to the train load characteristics for eastbound trains over the same territory (Fig. 2), it is seen that the general

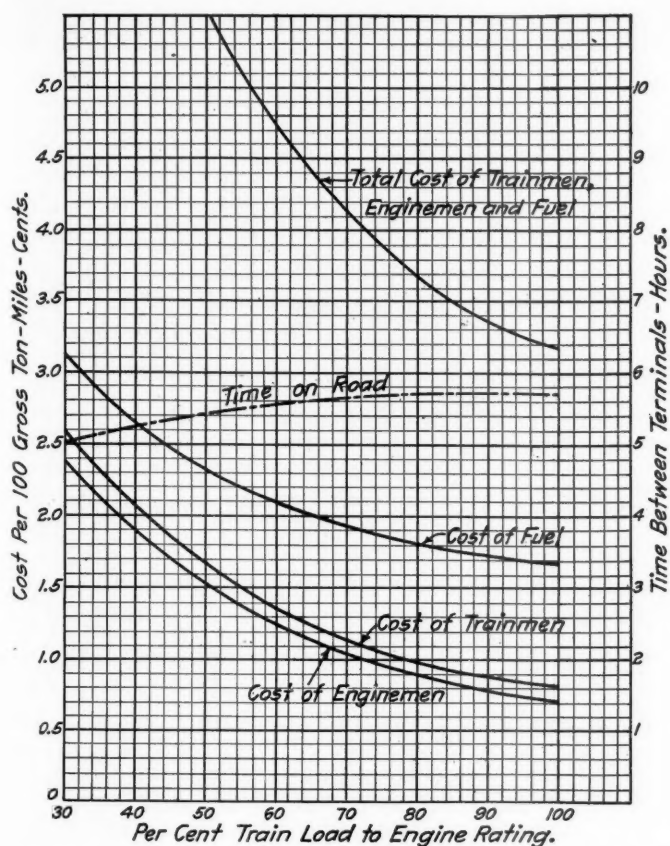


Fig. 1—Relation of Cost per Hundred Gross Ton Miles, Train Loading and Time on Road—Santa Barbara to San Luis Obispo

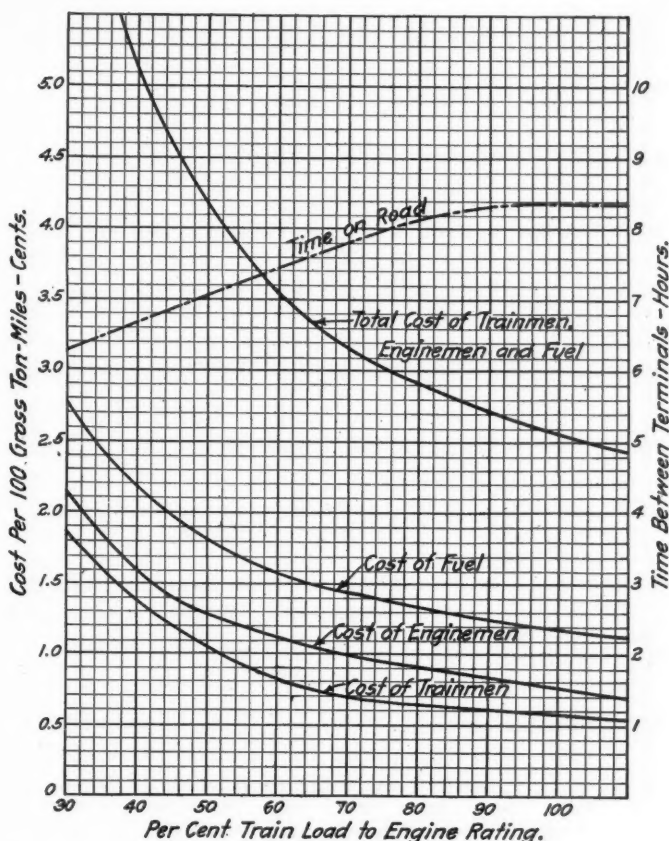


Fig. 3—Relation of Cost per Hundred Gross Ton Miles, Train Loading and Time on Road—San Luis Obispo to Watsonville Jct.

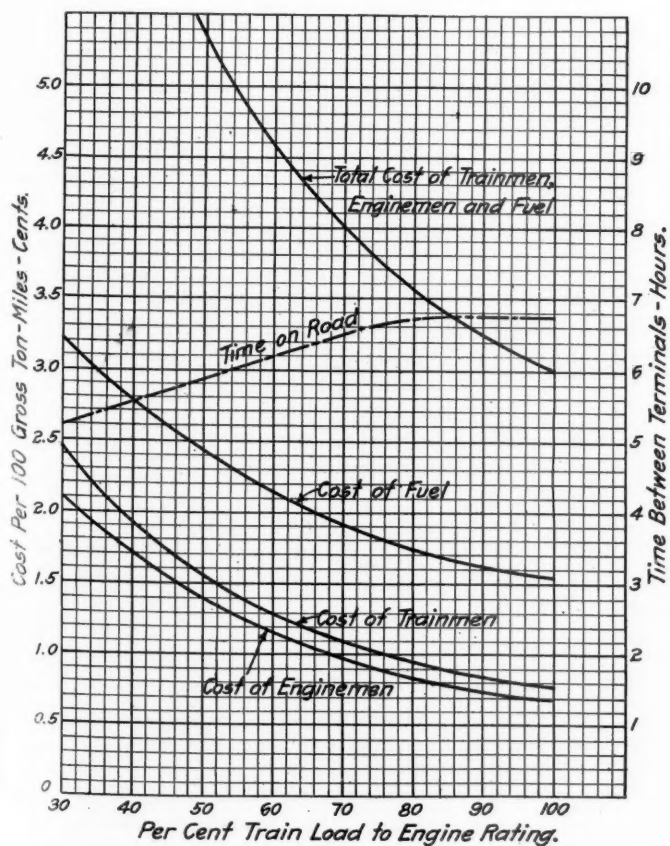


Fig. 2—Relation of Cost per Hundred Gross Ton Miles, Train Loading and Time on Road—San Luis Obispo to Santa Barbara

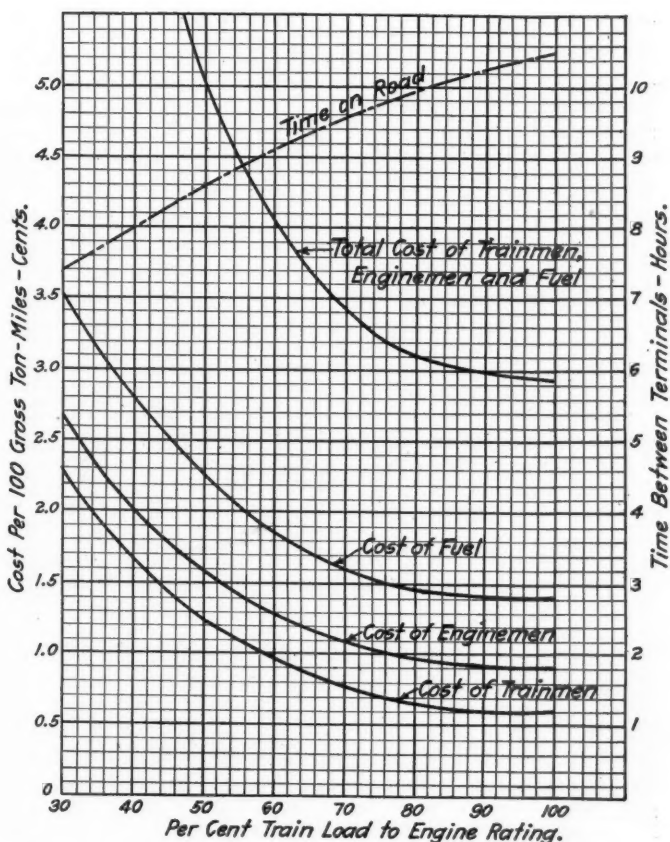


Fig. 4—Relation of Cost per Hundred Gross Ton Miles, Train Loading and Time on Road—Watsonville Jct. to San Luis Obispo

character of the cost curves is the same, but that the unit fuel cost is slightly lower than in the opposite direction. This is the result of the fact that the eastern terminal of this subdivision is 230 ft. lower than the western terminal, and that eastbound trains go up approximately two miles less of ruling grade than westbound trains. The time on the road is, curiously enough, a little over an hour greater for eastbound trains than it is for westbound trains. Sufficient causes to positively explain this fact are not apparent. The difference in delays due to meeting trains and to switching will not explain it, as may be seen by comparing figures 5 and 6. The points at which water stops are made present more unfavorable grade conditions for starting eastbound trains than is the case for westbound trains. Also, most of the crews live at San Luis Obispo, and there may be a tendency for them to make a little greater effort to make a fast run toward home than to make a fast run away from home. Other conditions, such as amounts of ruling grade and head winds, would favor eastbound trains. It will also be noticed that a 50 per cent train in this direction makes the trip in nearly an hour less time than a train loaded to 80 per cent. or more of engine rating.

Attention is also called to the fact that during the two months observed the westbound tonnage was about 30 per cent. greater than the eastbound tonnage, calling for a large number of light engine movements eastbound to balance the power. The cost

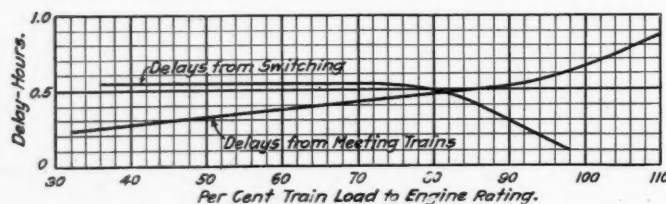


Fig. 5—Relation of Train Loading to Delay—Santa Barbara to San Luis Obispo

of these light engine movements is an expense of Class 2 as noted above, chargeable to westbound trains but not usually definitely incurred on account of any particular trains, but rather on account of unbalanced tonnage.

It therefore would appear that to obtain the most economical result trains eastbound out of San Luis Obispo should be generally loaded to full rating of power. This is somewhat modified by the fact that some light engines must be run, so if particularly fast time is desired there is considerable justification in loading such trains to something under 60 per cent. of engine rating, the additional total cost being only moderately greater than the difference between the full mileage made by train crew

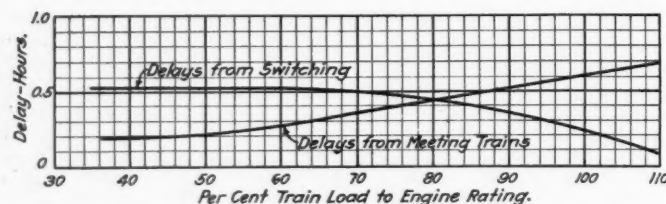


Fig. 6—Relation of Train Loading to Delay—San Luis Obispo to Santa Barbara

working and the two-thirds mileage they would make if dead-headed to protect westbound tonnage.

Referring to the curves of train load characteristics of the Watsonville Junction-San Luis Obispo subdivision westbound (Fig. 3) it is seen that the unit costs show a decrease with increased engine load to 1.18 cents for fuel, 0.76 cent for enginemen and 0.58 cent for trainmen, for a train loaded to full rating of power, and a further decrease to 1.12 cents for fuel, 0.70 cent for enginemen and 0.55 cent for trainmen, when a train of 110 per cent. of rating is used. It is again significant to note that al-

though the time on the road increases in proportion to the load until a load of 90 per cent. of power rating is reached, the time on the road is not further increased by loading above that point. The table of physical characteristics again indicates that the reason is because a fully loaded engine has its speed limited by time table speed restrictions for over 55 per cent. of the total distance. The delay curves (Fig. 7) indicate that delays due to switching, as well as delays due to meeting and being passed by trains, are slightly proportional to the load. This is because

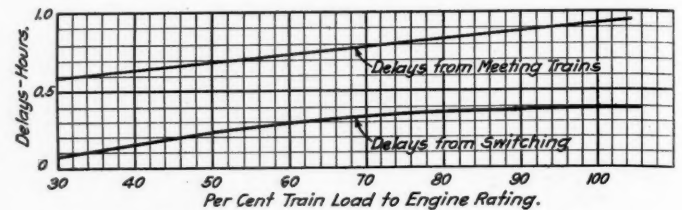


Fig. 7—Relation of Train Loading to Delay—San Luis Obispo to Watsonville Jct.

westbound trains in this territory have more setting out than picking up, and the amount of such set out switching is approximately proportional to the total number of loads in the train.

The curves for this subdivision therefore indicate that San Luis Obispo should load westbound trains to full tonnage, and when practicable, arrangements should be made to fill out with dead freight at Santa Margarita to 110 per cent. or more of road engine rating, for this amount can be readily handled westbound from Santa Margarita. Of course, trains over the helper territory should not have more than 50 cars on account of curve and tunnel conditions on the hill, and ample helping power should be provided to prevent possibility of stalling between

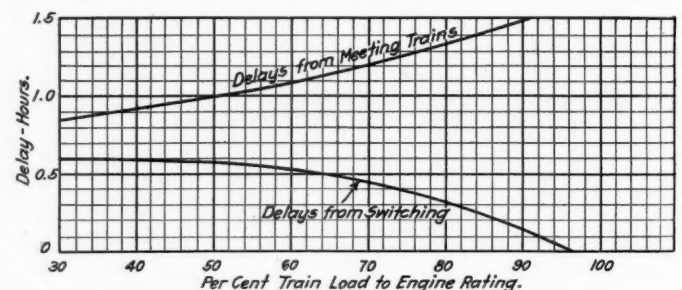


Fig. 8—Relation of Train Loading to Delay—Watsonville Jct. to San Luis Obispo

San Luis Obispo and the summit. The fill out at Santa Margarita should consist of dead freight which could be taken from San Luis Obispo at convenient times by turn-around trains.

Turning to the curves of train load characteristics of the Watsonville Junction-San Luis Obispo subdivision eastbound (Fig. 4), a somewhat different situation is found. Although as before the lighter train loads have a high unit cost, it is seen that after a load of 80 per cent. of engine rating is obtained there is no large decrease in unit cost for a greater load, and after 90 per cent. of rating is placed behind an engine the unit cost remains practically constant. It will be noted that while the shape of the other characteristic curves (Figs. 1, 2 and 3) indicates what is often taken to be axiomatic, namely, that if an engine could be operated with even greater than 100 per cent. load, the unit cost would be still further reduced, the curves of the Watsonville Junction-San Luis Obispo subdivision eastbound (Fig. 4) indicate that in this case the loads in addition to 90 per cent. of engine rating do not further decrease the unit cost. The long steady climb tends to make the speed slow for heavy trains, the time on the road increasing nearly proportional with the load, and this in turn adds to the probability of overtime and its resulting increased crew expense for heavy trains. The

reason that the time on the road increases with the load in this case as contrasted with the others is that here a fully loaded engine has its speed limited by the load for nearly 78 per cent. of the total distance. Furthermore, since an engine is required to thus work to capacity nearly the whole distance with a full train, unit fuel costs remain nearly constant for loads over 80 per cent. of engine rating. The delay curves (Fig. 8) show that although the heavy trains are not required to do as much switching (it is picking up rather than setting out that causes switching to eastbound trains) the time required to meet and be passed by trains is decidedly greater for heavy trains, indicating the increased difficulty of starting trains on grade.

It therefore appears that for most economical and satisfactory operation eastbound trains of dead freight out of Watsonville Junction should be given a full load if such full load is immediately available. However, after an 80 per cent. train is available the train should be sent forward without waiting for additional tonnage, as such additional tonnage will mean additional time on the road as well as the additional terminal delay and with but little or no decrease in unit cost. High class manifest or perishable freight should not be forwarded in trains loaded to more than 80 per cent. or 90 per cent. of engine rating in this

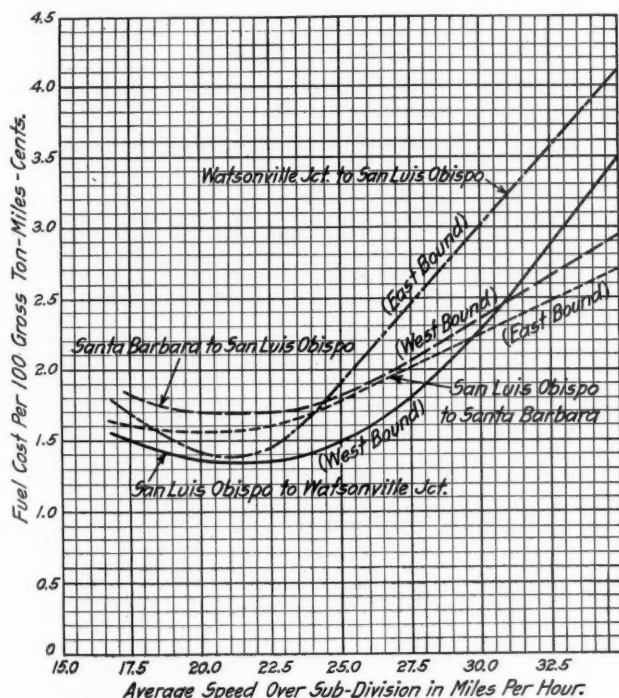


Fig. 9—Curve Showing Relation of Fuel Cost to Train Speed

territory because time is very vital with such freight and with more than this amount of tonnage not only will the time of runs be increased but the unit costs will not be very materially decreased.

It should be kept in mind that in periods of heavy business, with the usual tendency toward a shortage of both cars and power, the matter of time consumed on the road and at terminals is of added economical importance for both dead freight and high class freight. At such times, therefore, it would probably be economical to keep all train loads (including dead freight) down to about 80 per cent. of engine rating for the Watsonville Junction-San Luis Obispo subdivision eastbound.

The curves above described are based on engine loading and were designed to show the most economical load to give a train for a given run. The curves shown in Fig. 9 are based on train speed and are designed to show at what average speed a train should be run for the greatest fuel economy. Obviously, the cost of crews will be independent of the speed of the train so long as the speed is not so low as to cause overtime. The curves of Fig. 9 are based on the average speed of trains between ter-

minals while actually in motion, instead of being based on the total time between terminals.

Sufficient territory has not been analyzed to make any very conclusive general deductions, but the curves at hand would indicate that over a territory where the ruling grade is encountered for only a small proportion of the total distance, it is not only much more economical to fully load the engines, but that the schedule of a train is not seriously retarded by such capacity loading. On the other hand, when the ruling grade is encountered over the most of a district the economy of loading trains above a certain point is not so marked and the time taken to make the run in such a case increases somewhat in proportion to the load.

Assuming that the method of this empirical analysis is fundamentally correct, some such study of train performance could be advantageously made on any freight subdivision. For the best results, such an investigation should cover a sufficiently long period to give thoroughly representative conditions. With sufficient data, the field of analysis could be very much extended, with correspondingly increased benefits. Were the data collected for a period of one year, curves could be plotted for the whole period, for certain special periods throughout the year, for separate classes of service such as through freight and local freight, for various types of power, and even for individual engineers if desired. Such an extended analysis would not only demonstrate the best general train loading for particular seasons and special conditions, but also the best type of power for particular conditions. These curves might also throw some light on desired possible changes of labor schedules that could valuably be made use of in connection with labor conferences. These and many other phases of train operation might be made to stand out very satisfactorily by proper manipulation of the data. By taking advantage of the facts as demonstrated, it is almost certain that considerable saving usually could be effected in train operation with scarcely no additional burden being placed on men or officers, but by merely taking the greatest possible advantage of clearly analyzed laws of train operation.

TABLE OF PHYSICAL CHARACTERISTICS

Item	San Luis Obispo Santa Barbara subdivision		Watsonville Jct. San Luis Obispo subdivision	
	West	East	West	East
Distance between terminals (miles)....	119	119	152	152
Ruling grade (helper territory), per cent. ....	...	...	2.2	2.2
Proportion of subdivision that time table speed restrictions limit speed of fully loaded engine, per cent.....	1.13	1.13	0.83	0.74
Proportion of subdivision that power limits speed of fully loaded engine, per cent.	63.7	67.7	55.3	22.4
Total ascents (non-helper territory), ft.	1,930.8	1,691.0	469.1	1,442.4
Total ascents (helper territory), ft.....	...	...	1,103.5	345.6
Net increase in elevation (non-helper territory), ft.....	229.8	-229.8	-973.3	973.3
Net increase in elevation (helper territory), ft. ....	...	...	757.9	-757.9
Maximum difference in elevation of any two points on subdivision, ft.....	391.0	391.0	1,337.9	1,337.9

THE HAICHOW-LANCHOW RAILWAY OF CHINA.—Construction work is now under way on the railway from Honanfu to Lanchow in Kansu, via Sian, traversing Shensi from east to west. Honanfu is now the western terminus of the Pien-lo Railway, which crosses the Peking-Hankow line at Chengchow, and has its present eastern terminus at Kaifengfu, the capital of Honan. It is planned to extend the line, however, to Haichow, a seaport on the coast of Kiangsu. Work is actively proceeding on the section between Honanfu and T'ungkuan, the line being open for traffic as far as Tiehmen, some 45 miles from Honanfu and 230 miles from Sian. When completed this railway will solve the transportation problem, now the greatest hindrance to foreign trade in Shensi. It is hoped that traffic may be running to T'ungkuan in two years, and to Sianfu in three. The construction work is being undertaken by a Belgian syndicate for the Chinese government, under the supervision of inspecting engineers appointed by the latter.

TRAIN ACCIDENTS IN MAY¹

Following is a list of the most notable train accidents that occurred on railways of the United States in May, 1914:

Collisions

Date.	Road.	Place.	Kind of accident.	Kind of train.	Kil'd.	Inj'd.
14.	Atlantic C. L.	Palmer, Ga.	rc.	P. & F.	2	0
18.	Texas & P.	Jefferson.	xc.	F. & F.	0	4

Derailments

Date.	Road.	Place.	Cause of derailm't.	Kind of train.	Kil'd.	Inj'd.
4.	Lehigh Valley	Mauch Chunk.	exc. speed	F.	1	1
5.	Wabash	Decatur.	d. switch	P.	2	8
5.	Chicago I. & L.	Lowell, Ind.	acc. obst.	P.	0	6
8.	Southern	Hillsboro, N.C.	.....	F.	3	1
19.	Atlantic C. L.	Darlington.	unx.	P.	0	11
23.	Seaboard A. L.	Anderson.	malice	P.	1	2
27.	M. Kansas & Tex.	W. Point.	d. truck	F.	2	1
27.	Kansas City So.	Spencer.	d. truck	F.	1	0
30.	C. C. C. & St. L.	Wharton.	.....	P.	0	2
31.	Baltimore & Ohio	Cumberland.	exc. speed	F.	5	4
31.	Wichita Val.	Abilene.	d. truck	P.	0	16

Other Accidents

Date.	Road.	Place.	Cause of accident.	Kind of train.	Kil'd.	Inj'd.
4.	Baltimore & Ohio	Arden.	boiler	F.	1	1

The trains in collision on the Atlantic Coast Line near Palmer, Ga., on the 14th, were a southbound passenger and a southbound freight. Passenger train No. 209 of the Southern ran into a freight of the Atlantic Coast Line, overturning the engine of the passenger train and wrecking the caboose of the freight. The engineman and fireman were killed. The passenger train had run past a flagman.

The trains in collision at Jefferson, Tex., on the 18th were a special, consisting of a locomotive and a pay car, and a local freight. The pay car train ran into the freight while it was switching on the main track. Four employees were injured.

The train derailed near Mauch Chunk, Pa., on the 4th, consisted of only a locomotive. The engine was overturned and the engineman was killed. The fireman was seriously injured. The cause was excessive speed on a curve of 14 deg.

The train derailed at Decatur, Ill., on the 5th, was the westbound Continental Limited Express. The two rear cars were thrown against coal cars standing on a side track, and two passengers and six trainmen were slightly injured. The derailment occurred at a switch, the points becoming loose when a sleeping car passed over them.

The train derailed near Lowell, Ind., on the 5th, was northbound passenger No. 4. One sleeping car was partly overturned. Six passengers were injured. The derailment was due to the loosening of a switch caused by a mail bag, which was thrown from a car in the train and struck the switch stand.

The train derailed near Hillsboro, N. C., on the 8th, was an eastbound freight. Ten cars were wrecked. Three boys stealing rides on the train were killed and a fourth was injured.

The train derailed near Darlington, S. C., on the 19th, was southbound passenger No. 69. The engine was overturned and the first two cars were ditched. Six passengers and five employees were injured, none seriously. The cause of the derailment is reported as not determined.

The train derailed at Anderson, Ga., on the 23rd, was northbound passenger No. 4. At about 1 a. m. the train ran over a misplaced switch and the engine and two express cars were derailed. The engineman was killed and two other trainmen were slightly injured. The switch had been maliciously loosened and the light extinguished.

The train derailed near West Point, Tex., on the 27th, was local freight No. 97, and the engine and four cars were ditched.

¹Abbreviations and marks used in Accident List:

rc, Rear collision—bc, Butting collision—xc, Other collisions—b, Broken—d, Defective—unf, Unforeseen obstruction—unx, Unexplained—derail, Open derailing switch—ms, Misplaced switch—acc. obst., Accidental obstruction—malice, Malicious obstruction of track, etc.—boiler, Explosion of locomotive on road—fire, Cars burned while running—P. or Pass., Passenger train—F. or Ft., Freight train (including empty engines, work trains, etc.)—Asterisk, Wreck wholly or partly destroyed by fire—Dagger, One or more passengers killed.

The engineman and fireman were killed and a brakeman was injured. The derailment was due to sliding of an embankment, which was a result of continued heavy rains.

The train derailed near Spencer, Tex., on the 27th, was a southbound freight. One trespasser was killed. The cause of the derailment is believed to have been improper adjustment of a car body on one of its trucks.

The train derailed at Wharton, Ohio, on the 30th, was northbound passenger No. 1. Six coaches ran off. The baggageman and one dining car employee were injured.

The train derailed near Cumberland, Md., on the 31st, consisted only of a locomotive, a passenger engine without a train. The engine was overturned, in consequence, it is believed, of excessive speed. It was running on straight track and fell down a low bank. On the engine were the members of a freight crew; and of the nine men aboard, five were killed and four injured, one fatally.

The train derailed near Abilene, Tex., on the 31st, was southbound passenger No. 1. Three cars were wrecked and 16 passengers were injured. The cause of the derailment was the weakening of the roadbed by a heavy rain.

The accident on the Baltimore & Ohio near Arden, W. Va., on the 4th, was the explosion of the boiler of a locomotive on a freight train. The fireman was killed and the engineman injured. Cause, low water.

Electric Car Accidents.—Of the accidents reported in the newspapers as occurring on electric railways in the United States in the month of May, only one appears to have been attended with fatal results. This was a derailment in Detroit, on the fifth, when a motorman was killed and four passengers were fatally injured. The car ran off the track and crashed against another car moving in the opposite direction. Twenty-seven passengers, altogether, were injured.

Canada.—Five derailments of passenger trains were reported in Canada in May, none of which, however, appears to have been attended with fatal results. These derailments occurred as follows: North Bend, B. C., on the Canadian Pacific, May 6; Rose Lake, B. C., on the Grand Trunk Pacific, May 8; Richmond, Que., on the Grand Trunk, May 9; Buxton, Ont., on the Michigan Central, May 14.

RESULTS OF GOVERNMENT OWNERSHIP IN BELGIUM

The Bureau of Railway News and Statistics has issued the following:

"Striking evidence of the extravagance of government railway operation as compared with private management subject to the demands of a commercial enterprise is furnished in the annual report of the railways of Belgium for 1912. Belgium is a country primarily of government ownership, but there are still five small companies operating railways. Whereas in 1911 the state lines out of every \$100 in gross receipts paid \$66.89 to operate, they paid in 1912 the sum of \$69.33.

"Against this figure the private companies in 1912 paid out of every \$100 of gross receipts respectively only \$38.52, \$56.11, \$59.22, \$62.26 and \$67.19, the largest of the five companies making the best showing and the average for all being \$41.42.

"Returns for the government railways for 1911 and 1912 compare as follows with the private lines in 1912:

	State, 1911	State, 1912	Private, 1912
Operated mileage	2,684	2,696	217
Receipts (thousands)	\$60,610	\$63,949	\$6,797
Expenses (thousands)	40,545	44,327	2,815
Net (thousands)	20,065	19,622	3,982
Ratio expenses to receipts (per cent.)	66.89	69.33	41.42

"Operation of the government lines has left the public railways bankrupt. Against their net after paying operating expenses which amounted, as shown above, to \$19,622,000 must be set the charges made on the railway budget for interest and sinking fund on the railway debt and for the rental of the small mileage lying in foreign territory. The charges amounted in 1912 to approximately \$20,384,081, so that there was an actual deficit."

Jersey Central Engine Terminal at Communipaw

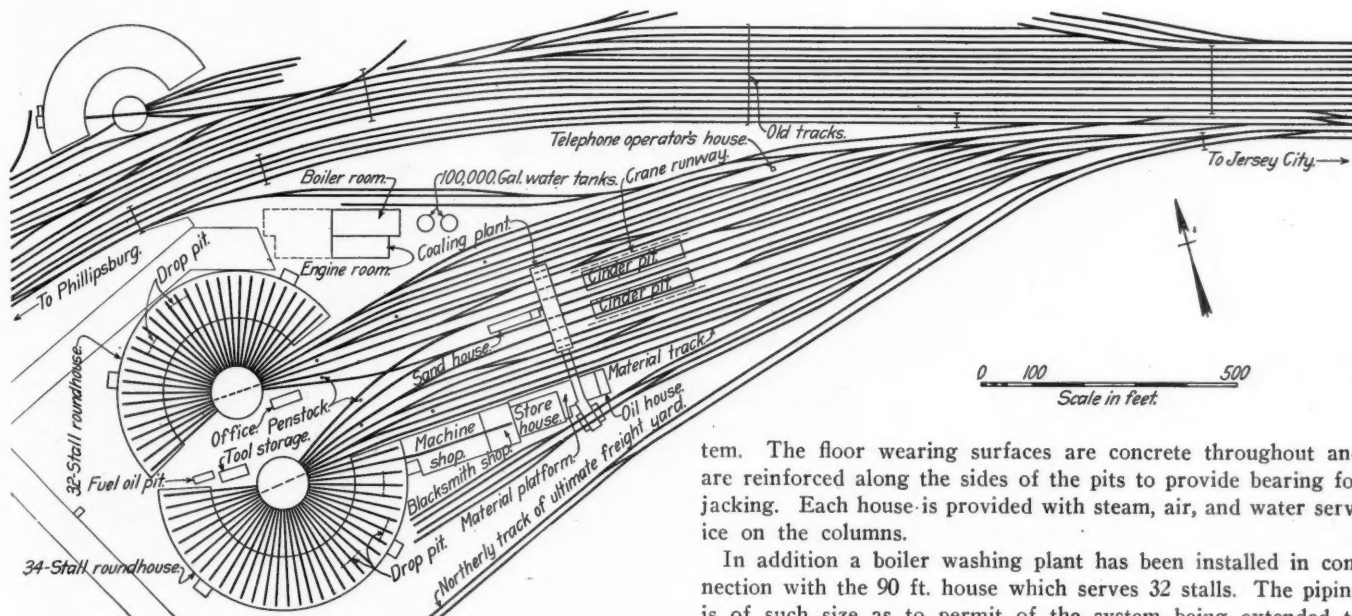
New Facilities Near Jersey City, N. J., for Handling
Over 250 Freight and Passenger Engines Per Day

The Central Railroad of New Jersey has recently completed a large and unusually complete engine terminal at Communipaw, N. J., in order to provide increased facilities for handling rapidly and economically, the locomotives entering the Jersey City terminal. These engines were formerly cared for in the two old terminals at Fiddlers and Communipaw, through which were handled 30,823 locomotives during the first four months of the present year, or an average of 225 locomotives per day. The number of engines handled per day is increased to about 300 during the summer months.

The new plant is located on the south side of the main line tracks about one mile west of the passenger terminal and opposite the freight yard. The terminal facilities are arbitrarily divided so that the freight and passenger engines can be handled separately, although the necessary flexibility has been provided in the track arrangement to permit the free use of either of the two engine houses by passenger or freight engines, as may be

ROUNDHOUSES

The roundhouses are constructed of reinforced concrete columns, piers and roof girders with hollow tile and concrete roofs. The rear wall consists of concrete piers approximately 5 ft. wide with steel sash between, with an 8 in. brick wall below these windows. This arrangement permits a maximum window space both for lighting and ventilation. The roof line is broken at the first row of columns at the front of the building so as to give a row of hinged sash over each stall. Additional ventilation is provided by means of three-chamber 4-in. hollow tile set in the rear wall above the windows and in the locomotive door lintels. There are also ventilating openings above the sash in the roundhouse monitors. This arrangement follows the Jersey Central standard practice and provides an outlet for any gases that may collect under the ceiling, which is a flat arch giving an unobstructed path for gases to pass out through the ventilator openings. Both houses are heated by the indirect sys-



Plan Showing Buildings and Tracks at Jersey Central Engine Terminal at Communipaw, N. J.

found desirable. The improvement comprises two roundhouses, one with 34 100-ft. stalls and one with 32 90-ft. stalls, a power house, machine shop, blacksmith shop, storehouse and office, material platforms, oil house, cinder pits, coaling station, sand storage, roundhouse office and toilet building, engineers' locker building and telephone tower.

The ground is principally cinder fill, varying in depth from 2 ft. to 10 ft. on an underlying strata of blue clay, sand and bog, except where the old shore line runs across the west end of the property. In consequence all the buildings rest on piles with the exception of the west half of the roundhouses, where the ground conditions are favorable for footings. The foundations of the buildings consist of concrete pile caps and piers where the concentrated loads are imposed, with reinforced concrete wall girders supporting the building walls. The power house, however, rests on a concrete slab 4 ft. thick, extending under the entire building. This slab is supported on piles spaced equally under the entire mattress. All the buildings are constructed of reinforced concrete, steel, and brick with steel sash, wooden doors, and concrete floors. The roofs of all buildings except the coaling station are covered with three-ply felt roofing.

tem. The floor wearing surfaces are concrete throughout and are reinforced along the sides of the pits to provide bearing for jacking. Each house is provided with steam, air, and water service on the columns.

In addition a boiler washing plant has been installed in connection with the 90 ft. house which serves 32 stalls. The piping is of such size as to permit of the system being extended to the 100 ft. house should it be desired at a later date.

Asbestos smoke jacks are at present installed, but the roofs of the houses are designed to sustain the weight of cast iron jacks should it be found desirable to install them in place of the asbestos jacks.

Both houses are lighted by tungsten lamps, the wires being carried in conduits under the floors and in columns. There is installed in the 90 ft. roundhouse one driver and truck drop pit, and in the 100 ft. house two driver and one truck drop pit, each extending over three stalls which have pneumatic jacks for wheels and a one-half ton crane for handling driver boxes, etc.

The entrance doors to the stalls are hinged to pintle posts, which are entirely separate from the building proper and so fastened to the building columns that the accidental wrecking of a door will not damage the building structure. Each roundhouse is served with a 100 ft. deck turntable of heavy construction operated by electric tractors.

POWER HOUSE

The new power house serves not only the engine terminal, but also supplies electricity for all of the railway requirements between the Jersey City water front and Newark Bay. The house is 135 ft. long and 92 ft. wide, with concrete boiler and machine foundations. The building proper is of brick with a structural steel frame for supporting boilers, stack, and coal bunk-

ers; it has steel sash and doors. Six 250 h. p. B. & W. water tube boilers arranged in three batteries of two each are installed and space is provided for an additional battery. Automatic stokers feed the furnaces. A lined steel stack 10 ft. 6 in. in diameter and 75 ft. high above the roof furnishes natural draft aided by automatically controlled turbine type blowers. The ash and coal handling arrangement is such that the railroad car, used to bring in coal, loads with ashes without changing its position.

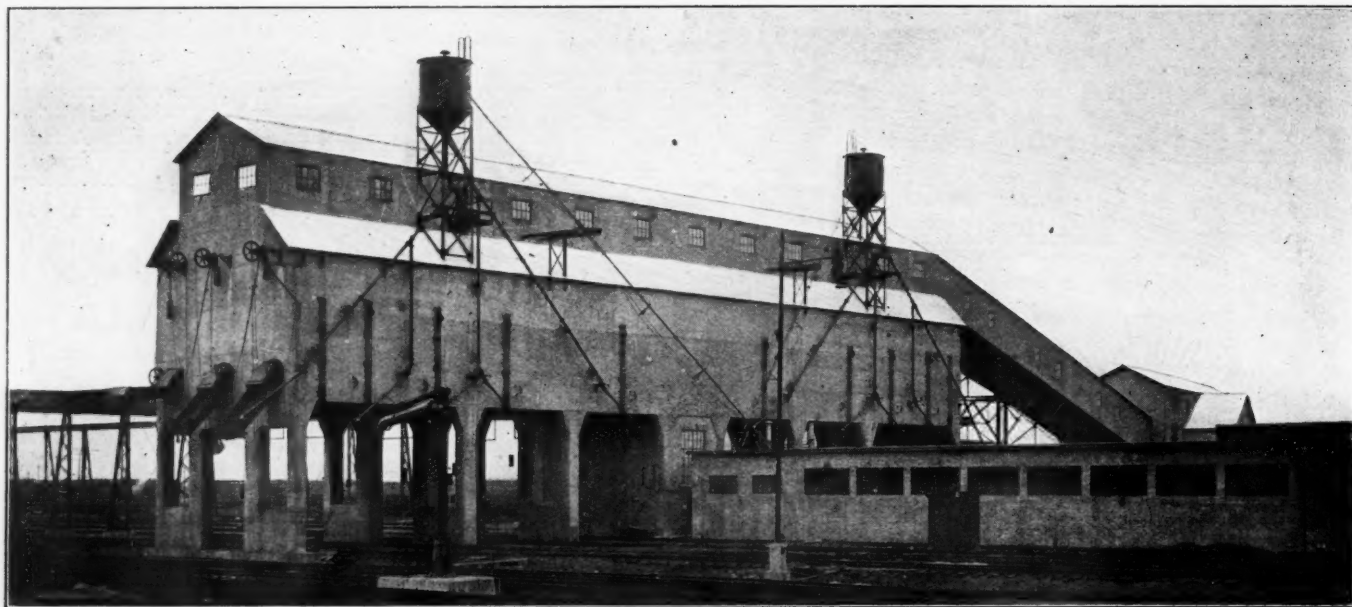
Three 600 k. w., 2,200 volt a. c. General Electric turbo generators are installed with space provided for a fourth unit. Two 2,500 cu. ft. compound steam two-stage air compressors furnish air for the engine terminal, and also for the operation of switches and signals in the terminal yard between Communipaw and Jersey City and to Elizabethport and Newark on the main line and the Newark branch.

The plant operates normally condensing. In cold weather the exhaust steam is used for heating the buildings in the terminal. A mixing condenser is located in the engine room basement. As the water used for condensing purposes is taken from the Jersey City mains and metered, condensing water is used over again and cooled in a cooling tower. An automatically controlled motor-driven centrifugal pump located in the basement is used

a three-ton gib crane is located in the center of the blacksmith shop space. The equipment of the boiler shop consists of a motor driven punch and shears, hand bending rolls, flange fire and screw flanger. A concrete ramp is located at the northeast corner leading to the material platform by means of which material may be brought directly to the machine and blacksmith shops from the storehouse.

The storehouse is 100 ft. long and 60 ft. wide, and directly adjoins the blacksmith shop building. Its construction is fireproof throughout. Steel bins and counters are used for storing material, so that except for any combustible contents the fire hazard is reduced to a minimum. The building is at present one story in height, but the foundation walls and columns are designed heavy enough for a second story should it be found necessary to construct this addition at a later date. The easterly end of the building is divided by fireproof partitions into offices for the general foreman and the storekeeper and the toilet and wash room. The material platform is 48 ft. wide and 80 ft. long, and extends 12 ft. in width along the north side of the storehouse. This structure is built of reinforced concrete and hollow tile with a concrete wearing surface.

The oil house located at the extreme east end of the material



Reinforced Concrete Coaling Station and Sandhouse Serving Engines on Ten Tracks

for raising water into elevated tanks when necessary. There is also a 1,500-gal. underwriters' pump connected to high pressure fire lines in the yard and buildings.

OTHER BUILDINGS

Adjoining and directly connected to the 100 ft. roundhouse is a machine and blacksmith shop building, 200 ft. long, 80 ft. wide and 28 ft. high. A monitor 13 ft. wide extends over the entire length of the building and is provided with continuous top-hung steel sash operated from the machine shop floor. Toilet and locker room facilities are provided in a small extension located between the main building and the 100 ft. roundhouse. Access to this toilet room and locker room may be gained either from the machine shop or the roundhouse.

The machine shop space is 140 ft. long by 80 ft. wide, and has a concrete floor throughout. The equipment consists of small lathes, crank planers, and such other similar machines as may be required for light running repairs.

The blacksmith and boiler shop is located at the east end of the building and is separated from the main or machine shop by a fireproof wall. The south half is occupied by the blacksmith shop, which is equipped with five down-draft forges, each served by a one-half ton gib crane. A 2,000 lb. steam hammer served by

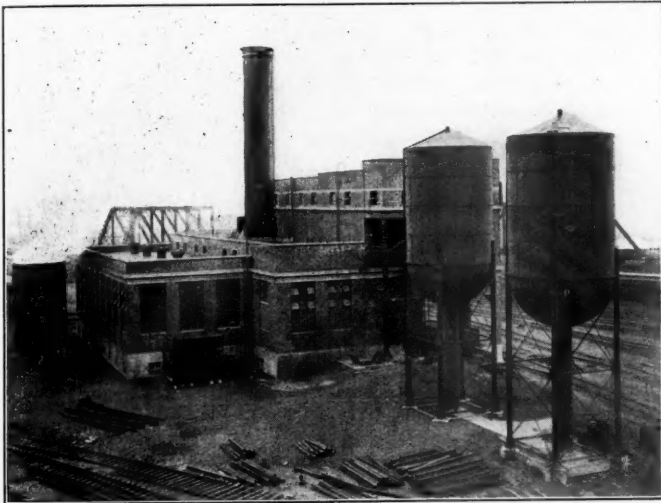
platform is 20 ft. wide, 48 ft. long and one story high with a 10 ft. basement in which the oil storage tanks are located.

COALING STATION

The most interesting structure of the group on account of its size and construction is the coaling station. The main building spans 8 tracks and serves an additional track at each end. The structure is 168 ft. long, 34 ft. wide, and 55 ft. high, and is of reinforced concrete throughout. The bunkers rest on special steel I-beam girders encased in concrete and the hopper bottoms are built of reinforced concrete with hollow tile. The sides of the bunkers are heavily reinforced to withstand the side pressure of the coal when the bunkers are filled. A monitor extending the full length of the structure is of steel trusses with 2 in. plastered concrete sides and is provided with an asbestos roof. The coal is received from the cars in two receiving hoppers from which it is discharged by means of reciprocating feeders into bucket-conveying elevators. These conveying elevators carry the coal to the top of the hopper house, where it is discharged on two 30 in. belt conveyors running up the conveyor bridge over the top of the bunkers. Traveling trippers running on rails above the bunkers discharge the coal into various compartments.

There are three longitudinal bunkers having a capacity re-

spectively of 430 tons of bituminous, 813 tons of broken, and 430 tons of buckwheat coal. These bunkers are each divided into four compartments by transverse concrete partitions. Each track is served by three coal chutes so that an engine on any one of the ten tracks may be coaled with either bituminous, broken, or buckwheat coal. The conveying machinery is divided into two units from the track hopper to the tripper over the bunker, each unit having a conveying capacity of 100 tons per hour. Provisions are made, however, whereby either track hopper, elevator, or conveyor of one unit may discharge its contents onto the elevator or conveyor of the other unit and in addition the trippers are

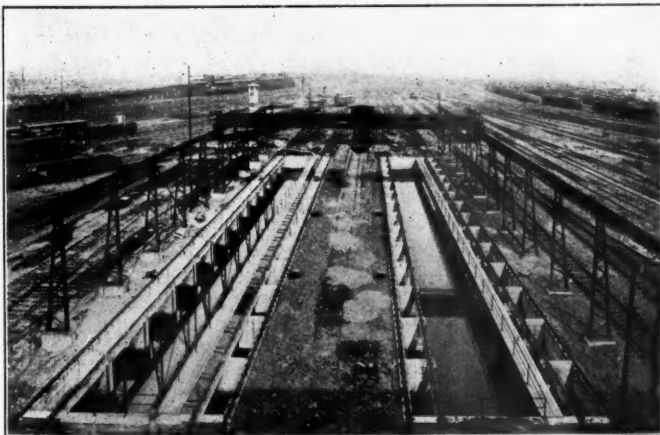


The Power House and Water Tanks

so arranged as to discharge into either one of the three bunkers. This flexibility reduces to a minimum the possibility of shutting down the entire plant due to a breakdown or other emergency. The entire machinery is electrically driven.

OTHER FACILITIES

Sand is stored and dried in a building of reinforced concrete 103 ft. long, 16 ft. wide and 14 ft. high. The green sand is dried by means of two coal stoves and is then screened and elevated by



The Two Submerged Cinder Pits with Traveling Crane for Loading Ashes into Cars on Center Track

means of compressed air to two storage tanks of 15 cu. yd. capacity, each located on top of the coaling station. From these tanks the sand is delivered to the locomotive through cast iron delivery pipes and wrought iron telescoping spouts serving each of the ten tracks.

The two cinder pits are of the submerged type. They are each 200 ft. long, 30 ft. wide and 12 ft. deep, and are of heavy reinforced concrete construction throughout. Each pit serves

two tracks, which are 26 ft. center to center. The pits are parallel and are about 58 ft. center to center with a track for cinder cars between. The cinders are cleaned out of the pits by a 4-ton electric traveling crane operating a 15½ yd. clam shell bucket. This crane is located on a steel runway 240 ft. long, with a 99 ft. 6 in. span and 26 ft. above the rail. Aside from the economy and speed in handling engines over the pit this arrangement permits the coaling of engines from cars by means of the clam shell bucket, should occasion arise. The miscellaneous buildings include the engineers' tool storage building, the roundhouse toilet and office building, and the telephone tower. The latter is located at the east end of the yard and the operator has full view of all outbound engines, so that he can notify the tower man as to their location.

The water supply is taken from a 16-in. city water main and



Thirty-Four Stall Roundhouse and Portion of Machine Shop

is discharged through altitude valves into two 100,000-gal. steel elevated tanks and then through the low or service system of piping to eight water columns in the yard for filling engine tanks and also into all of the buildings for general use. A high pressure system of piping is carried around the property and into the various buildings from the fire pump in the power house for fire protection.

The following general figures indicate the magnitude of the work:

Total number of piles driven.....	6,244
Total number of yards of concrete placed.....	27,000
Structural steel erected	966 tons
Number of bricks laid.....	1,473,100
Reinforcing steel used	546 tons
Gravel and crushed stone required.....	26,565 yd.
Sand used	16,000 cu. yd.
Board ft. of lumber and forms, scaffolds, sheet piling, etc.	841,991 ft.
Cement used	175,494 bags
Excavation and fills handled.....	54,366 cu. yd.

This work was designed and executed by Westinghouse Church Kerr & Company, New York City, in co-operation with and under the direction of Joseph O. Osgood, chief engineer, and A. E. Owen, principal assistant engineer of the Central Railroad of New Jersey.

MOTOR TRANSPORTATION ACROSS THE ANDES.—A proposal has been put forth for the establishment of an automobile transport service between Los Andes and the city of Mendoza. The proposed line expects a profitable business in manufactured wood articles, barrels in sections, sulphur, cement, galvanized iron, preserved fruit, etc. The service would be a daily one, but would only be possible from October to March or April, because of the climatic conditions. Trials have already been made on the Chilian side, showing that the journey upwards can be made in 90 minutes, and the downward trip in 70. The road on the Argentine side is said to be in bad repair, but a subvention is asked from the Mendoza provincial government which would be applied to road maintenance. Once the company is formed, repairs will be effected on the road which will permit the passage of automobiles carrying 12 or more passengers and motor trucks with 17,600 lb. of merchandise. It is supposed that it would be possible, once things were in running order, to charge rates of from ten to twelve pesos per ton instead of the twelve to seventy pesos charged by the Trans-Andean Railway,

THE VALUATION OF RAILWAYS*

By LOGAN G. MCPHERSON

Lecturer on Transportation at Johns Hopkins University

On March 1, 1913, the President of United States signed a bill directing the Interstate Commerce Commission to make a "Valuation of the Railways." It is quite customary for governmental bodies having the taxing power to make appraisals of property, but this federal valuation of the railways is not for purposes of taxation: the end which it is intended to serve is not specified in the bill.

The purposes for which the valuation is desired may be inferred, however, from the public discussion, the debates in Congress and the hearings of the congressional committees before the bill was enacted. There is a feeling on the part of many that the railways are overcapitalized; that is, that the par value of the stocks and bonds issued by the railways exceeds the value of their property. Linked with this is the feeling that the railways endeavor to keep their rates up to a level that will produce revenue sufficient to pay a return on the excess of capitalization.

It is to be noted that the utilization of the government as an agency to correct evils of overcapitalization and to limit the amount of profit is utterly foreign to the conception of the scope of the government when this nation was established. The utilization of the government as such an agency is foreign to the theory of competition under which business was encouraged.

Under the theory of competition the seller got as much as he could for what he had to sell, and the purchaser paid as little as he could for what he had to buy. It was thought that if the seller asked too much or if it were found that he was making too large profits, other producers would enter the market and the price would be brought down to the lowest level at which there would be sufficient production to supply the demand. This is the theory that applies to private enterprise. The utmost freedom of business activity was sought and defended as a national principle. Because of the belief in the impersonal restraints of competition there was no fear of abuse under the rights of private property and private initiative.

Although the railways had not from the beginning been accorded by law the freedom of private enterprise in its entirety, they enjoyed in practice in great degree until the end of the third quarter of the nineteenth century the freedom and the rights that pertain to private business in general. It was expected that through their multiplication competition would be established between them and that this would ensure fair charges and good service.

Under the competitive régime it was an accepted principle that a man was welcome to whatever he could gain from the use of any tool or instrument or other property that he had, regardless of what it might have cost or might sell for. If with a set of tools a carpenter by skill and knack could make more money than another carpenter with tools equally good he was welcome to it. It rested entirely with the individual as to whether he should buy a thing at the price for which he could obtain it. It rested entirely with the individual as to whether he should sell a thing at the price he could obtain for it. It rested entirely with the owner of a tool or instrument, or land, or other property whether he would use it entirely in his own immediate service, or whether he would dispose of its use by hire or rental, or whether he would use it for the production of things to be sold. If through either disposition gain accrued the gain was his. If through either disposition loss was entailed the loss fell upon him.

This free play of buying and selling at the will of the individual and at prices determined by bargaining between buyers and sellers, led to the conception of value which is held by economists, or rather the bifold conception of value enter-

tained by them, one phase of the conception being a corollary of the other. The first phase of this conception is that of value to the individual. The value of a thing in this sense is the estimate by the individual of the desirability of that thing for his own use or purposes. Such estimate depends upon the usefulness of the thing to its possessor—the benefit derivable from his immediate personal use of it, or the benefit he can derive from allowing it to be used by others for a consideration. The value of a thing in this sense is a matter of individual opinion. One person may place a higher estimate upon the desirability of a thing than another person. In the minds of different persons the value of a particular thing may vary widely, according to the degree of usefulness that they may respectively think it may have for them, or according to the return that they may respectively think they can derive by disposing of its use.

The other phase of the economists' conception of value is of value in the market. This value in the market develops out of the value to the individual, or rather out of the respective values that a thing may have in the minds of different individuals. The value in the market is the amount of money or of goods or of services for which a thing may exchange in the market. Obviously, if the value of a thing to himself as determined by the individual is respectively different in the minds of different individuals, the price which each of them may be willing to pay for the thing may differ from that which any of the others may be willing to pay for it. The actual market value, the amount of money which it will actually bring, is therefore the resultant of the views of those who are willing to buy and those who are willing to sell.

To repeat, value to the particular individual is merely the estimate of that particular individual of the desirability of a thing for his own use or purposes. Market or exchange value contemplates the purchase and sale of the thing. This market value emerges from the conflicting views of possible buyers and possible sellers as to the amount of money which the effective seller obtains from the effective buyer.

These two meanings of value, or rather these two correlated phases of value are the meanings that have been employed in the conduct of industry and commerce in this country. These definitions of value which have been arrived at by economists, those whose profession it is to study the distribution of things and services, by observation of the processes of industry and commerce in this country imply first, that the full attainment of value to the individual is only possible when a thing may be used without restraint; and, second, that the full attainment of value in exchange is only possible when a thing may be sold for what it will bring in an unrestricted market.

In the United States there have been few such restraints. The Constitution of this country was especially devised to give the utmost liberty to the people by placing checks upon any possible misuse of governmental power. The spirit of our forefathers was that of individualism. The restraints of competition were relied upon to prevent abuses.

The meaning, or rather the correlated meanings of the word "value" used by economists do not, however, always accord with the significance of the term in popular usage. The word is popularly employed in various other meanings and shades of meanings. Sometimes "value" is used simply to express an idea as to what a thing "ought to be worth." Another of these shades of meaning in popular usage is that "value" is the same as "cost."

In the act of Congress providing for a valuation of the railways these various other meanings are indicated by the expressions "original cost," "original cost to date," "cost of reproduction new," "cost of reproduction less depreciation," and "other values and elements of value." There is difference of opinion as to the practical significance of each of these expressions. Without discussing these differences of opinion here we will consider the application to a railway of the meanings of value ascribed to the economists.

The value of a railway to an individual from the standpoint

*A lecture delivered at the Johns Hopkins University.

of its serviceability to him cannot possibly be of practical significance in the determination of its current pecuniary value because the service of the railways is an absolute necessity to every person living within the confines of civilization. If they were confronted with the alternative of being deprived of railway service shippers and passengers would be willing to pay many times the prevailing charges for transportation.

The value of a particular railway to an individual may, however, be considered in the light of the railway as a source of income to the individual, if he be an investor in, or have money to invest in its securities. From this standpoint the value of a railway to an individual depends upon the profit or the expectation of profit from the traffic carried, from the rates charged; that is, the value of a railway to the individual investor is determined, broadly speaking, by its earning power.

The correlated meaning of value—that is, the market or exchange value of a railway—is also largely determined from the view of the railway as a source of income to the investor. That is, the market value of a railway's stocks and bonds emerges from the conflicting views of possible buyers and possible sellers as the amount of money per share or per bond which the effective seller obtains from the effective buyer. It is true that market quotations are affected by other conditions than desirability as an investment, but still desirability as an investment is normally the underlying consideration in determining market quotations.

What would be the market value, that is the exchange value, the sale and purchase value of a railway in its entirety is difficult of ascertainment because railways in their entirety are seldom bought and sold. But this market or exchange value is indicated with at least some degree of approximation by the market quotations of stocks and bonds. This is because the market price of a share of stock or of a bond of a railway company is the resultant of the judgment of all effective buyers and sellers of the benefits that may be derived from ownership of such stocks and bonds. These various judgments of buyers and sellers are determined in the main by their respective estimates of the earnings of the company and of the probability of their continuance. These estimates of earning power are in turn based upon their opinions of the character of the construction, equipment, and operation, of the location and connections of a railway, of its established traffic, and of its probable future traffic.

In this composite judgment are focused opinions as to the soundness of the capital issues and, as to the "water" that may be in them, of all factors in the past and in the present that affect the company and of those that bear upon its future. In this composite judgment that finds expression in the market value as indicated in the market quotations there is indicated at the one extreme the opinion of the careful student of affairs, and at the other extreme the haphazard guess of the stock speculator of a day.

Therefore as stocks and bonds are but evidences of the ownership of a railway, their market value is to a certain extent an indication of the value that will be placed upon the property as a whole at the time.

Under the theory of value so considered, the value of a railway to the individual investor and the market or exchange value of the stocks and bonds of a railway have been determined in this country by the play of economic forces. The par value, especially of railway stocks, is seldom a criterion of their market value. During the greater portion of the life of this nation any one who could obtain the requisite capital and had the requisite energy could build a railroad, and the railway could charge such rates as it could obtain virtually without political restriction. If the location of a railroad were well chosen, the greater the volume of its traffic and, other things equal, the greater were the profits to the investors. If a railroad were efficiently managed, other things equal, the greater the profits to the investors. If the location of a railroad were not well chosen, or if it were inefficiently operated, the less the

profits or perhaps the greater the losses to the investors. This was the status under which all business was developed. The utmost freedom was accorded private enterprise. The opportunities for gain were for those who could perceive and develop them, and who took the risks of loss.

In all business transactions there ruled the dictum of the common law, "Caveat emptor," let the purchaser beware. The railways in practice were private enterprises. They remain private enterprises in the sense that their capital is furnished by private investors and that a prime purpose of their operation is to yield profits to these investors.

The act of Congress directing the valuation of the railways is one phase of an evolution which would seem to be working out a radical modification of this status of the railways. Although the bill does not state the purposes of the valuation it was made evident throughout the congressional hearings and congressional debates preceding its passage that the foremost supporters of the valuation desired the results to become an element in the adjustment of rates. A valuation for the purpose of adjusting rates to capital value presupposes a right to limit the profits of the railways through a reduction of their rates; that is, a right to reduce their rates solely for the purpose of reducing their profits to a preconceived standard.

This is a view radically different from that of those who under the present status of private ownership hold the stocks and securities of the railways. These stock and security holders claim that so long as the rates of a railway are reasonable; that is, so long as each specific rate is reasonable for the specific service to which it applies, the railways are entitled to whatever profits traffic carried at such rates will yield: vice versa, in case such reasonable rates do not yield profits the stock and security holders are not entitled to return upon their capital. In other words, the real question in controversy is whether the railways are fairly entitled to earn what they can with rates that are reasonable for the service, or whether they are fairly entitled to no more than a specified return on what may be conceived to be their fair value.

It might seem at first that if those who hold the one concept of the extent to which the railways shall be allowed to earn profits are in the right, those who hold the other concept are in the wrong. It will be found, however, that those who adhere to the view that if the specific rates of the railways are themselves reasonable, the resulting profits should not be limited to a preconceived standard, have abundant justification in the principles which have underlain the development of the industry and the commerce of the United States and which are recognized by the courts. On the other hand, those who adhere to the view that the profits of the railways should be limited to a certain return upon the investment, are seeking to give practical application to a new concept of the relations between business, the government and the people that is developing as a result of changes in the organization of business and in the processes by which it is conducted.

Because the service of the railways benefits all producers, all distributors and all consumers, the rates and especially the rates for freight charged by them became of great public concern at an earlier date than did the prices for commodities in general. Indeed, there is a widely held conception that the railways in rendering a public service are performing what is essentially a governmental function, and that therefore they are merely agents of the public and accountable to it not alone for a proper discharge of their duties but for their administration in all its details. That some of the governments of continental Europe own and operate the railways would seem to be due in part to the fact that the control of the highways is essential to military defense, in part to the fact that under the paternalistic, absolutistic type of government that prevailed in continental Europe, the provision of railways came to be viewed in much the same light as the provision of highways, and in part to the fact that private capital was not forthcoming in amounts sufficient to construct the needed railway network. In England the situation is

different. There was exemption from the almost continual warring of the continent. Although it was the policy of the National Government to develop the solidarity of industry and commerce there was a long period before the obligation of the highways to the public and of the public to the highways was definitely established. A thoroughfare was not considered to be at the use of every citizen unless it were dedicated to the public use. A wagoner or stagecoach man did not come under the obligations of a common carrier until he professed himself at the public service. It was so also with the first railroads. As the economic power of the railways developed there was increasing governmental regulation in England, but there was no general expression of a belief that the provision of railway transportation is or ought to be essentially a function of the government.

The practice in England in many respects has served as a precedent for the United States. While the American people from the beginning have regarded the railways as rendering a public service, they have never expressed a mature consensus of belief that the provision of railway transportation essentially is or ought to be a function of the government.

The "government function" conception as applied to the railways has been strengthened in the minds of many by a certain analogy which they claim that the railways bear to a class of instrumentalities which, during the last generation, have come to be known as "public utilities." It is only fair to point out that there are great differences between both the status and the service of a railroad and that of a gas company, a water company, or an electric light and power company, the kind of corporations constituting the greater part of those designated as "public utilities."

A company of the latter kind operates usually under a franchise granted by a particular municipality to use the thoroughfares and perhaps other property of the city in furnishing its particular kind of service. Such a corporation under such conditions may have, within the limits of that city, an absolute monopoly. The service rendered by it is very nearly, if not entirely, of the same nature to all of its patrons. This service is usually so much of a necessity that the demand from a given population does not radically fall off even in a period of depression, nor is it subject to extraordinary increase from a given population even in a time of prosperity. The relation between the investment and the output is so readily calculable, that from a given price for a unit of output can be computed with close approximation the profit that the aggregate output at that price per unit will yield.

A railroad connecting two or more places between which there is no other effective communication by rail or by water may fairly be considered a monopoly. However, there are very few such railways in the United States and none of the first importance. The rail lines between almost any two considerable industrial and commercial centers are competitive, and for long-distance traffic a majority of the rail lines of the United States are in more or less direct competition with water routes. Even on local non-competitive traffic rates have to be made that will permit shippers to make a profit, that will develop the diversified traffic which a railroad needs for the continuous utilization of its equipment. To these ends there is an infinitude of rates that have to be adjusted to particular needs. Railway traffic is subject to wide fluctuations. In times of depression it falls off radically; it is subject to sudden spurts, and in times of prosperity to extraordinary rise. A railway company may have franchises which permit the construction and operation of tracks and terminals in the cities which it serves, but such franchises do not give it exclusive access to any city or the exclusive right to furnish transportation to that city. The property which it holds within municipal limits is usually more nearly akin to the property held by a manufacturing or a commercial enterprise.

Then again, there are those who hold that because of the public nature of the railway service there exists, or there ought to exist, the same kind of a partnership between the public and the

railways as is held, under this conception, to exist between the people of a municipality and a public utilities corporation. Those who have invested in the shares and securities of railways urge that the public nature of the business is not the only consideration of significance. The public looks to private enterprise to perform this public service; but private enterprise must assume all the responsibility for successful management and all risks of loss through unsuccessful management and through adventitious causes beyond its control. Now the railway business has far more risks of unsuccessful administration and far more risks of adventitious losses than prevail in municipal public service enterprises. Therefore, urge railway investors, the public must grant to the investors who provide railway transportation freer opportunity for gain than needs to be granted the "public utility" corporations operating under safer and more certain conditions within the limits of a municipality.

Aside from all these considerations as to what may be the relation that the railways bear to the public, is the difference of opinion as to what the Supreme Court of the United States has meant in the often-quoted sentences from its decision in *Smyth vs. Ames*. "We hold, however, that the basis of all calculations as to the reasonableness of rates to be charged by a corporation maintaining a highway under legislative sanction must be the fair value of the property being used by it for the convenience of the public. On the other hand, what the public is entitled to demand is that no more be exacted from it for the use of a public highway than the services rendered by it are reasonably worth."

There are those who claim that this and other decisions establish the "value" of a railway as the standard for the regulation of the general level of rates. Others claim that the Supreme Court has declared only that a railway is entitled to *at least* a fair return upon the fair value of the property which is being used for the public, that it does not express an opinion as to the measure of return above the minimum which the company is entitled to earn at reasonable rates and by efficient management: they claim that this decision supports the position that the railways are entitled to claim for their service what it is reasonably worth and within such limitation are entitled to the profit accruing from the service even although it yield more than the minimum return which is the least to which they are entitled.

This and other decisions bring up, however, another consideration which has been urged by the Interstate Commerce Commission. If that commission fix a rate at a point below that which will yield a fair return on the fair value of the property, it is liable to be adjudged as violating the constitution in that its action is confiscatory of property without due process of law. The commission states that in the absence of information as to the fair value of the property of a railway company it is unable to fulfil its function of fixing rates without risk of making them unconstitutional.

That there is great uncertainty as to what constitutes the fair value of a railway is made evident by the wording of the act of Congress directing the valuation. It is ordered that there be ascertained "original cost," "original cost to date," "cost of reproduction new," "cost of reproduction less depreciation," and "other values and elements of value." There is wide difference of opinion as to the practical significance of each of these expressions. Upon analysis each of these designations is found to comprise many factors, as to the meaning and determination of each one of which there are many further differences of opinion.

The task of bringing order out of chaos is that upon which the Valuation Board, created by and as an adjunct of the Interstate Commerce Commission, has entered. In the carrying of this task to a conclusion it is being assisted by the railways, who have appointed valuation boards which confer with the valuation boards of the commission.

In forming an opinion as to the usefulness of valuation as a basis for so regulating rates as to limit the profits of the railways it must always be borne in mind that by far the greater

proportion of the receipts of the railways is expended for maintenance, conducting transportation, taxes and other expenses pertaining to operation. Only a part of the revenue goes to the payment of returns on capital. It will be of interest to consider an illustration of the probable practical effect on railway rates if the valuation of the railways should be placed at an amount radically lower than their present capitalization, and rates be so adjusted as to provide revenue no more than sufficient to render a "fair return" upon that valuation. Perhaps the most extreme expression of the view that the railways of the United States are overcapitalized has not claimed that the excessive capitalization exceeds one-half of the present total. A concrete idea can be obtained by a specific calculation of the extent to which there could be a reduction in transportation charges because of even such a radical reduction in capitalization.

The net capitalization of the railways of the United States on June 30, 1910, was reported by the Interstate Commerce Commission as \$14,338,600,000. The net charges against capital for the year ending June 30, 1910, amounted to \$664,000,000. These charges consisted of net interest on funded debt outstanding and net dividends on stock outstanding. Let it be supposed that this was an adequate return upon the capital, and if by some imaginable means this capitalization were reduced by one-half, that one-half of this return, or \$332,000,000 would be adequate. This would make possible a reduction in the average receipts of the railways per ton mile, based upon the returns for the fiscal year 1910, from 7.53 mills to 6.62 mills, or ninety-one one-hundredths of a mill per ton mile; a reduction in the average receipts per passenger mile from 1.938 cents to 1.704 cents, or two hundred and thirty-four one-thousandths of a cent per passenger mile. That is to say, a reduction of 50 per cent. in the capitalization would permit a reduction of only 12 per cent. in the charges to the public; or, if the whole capitalization could be eliminated, so that there would be no claim for interest or dividends, the railway rates could not be reduced below 75 per cent. of their present level.

In the face of this slight reduction that even such a radically supposititious cut in the capitalization would permit, is the claim of the railway managers that the present capitalization is inadequate, that they have not sufficient revenue wherewith properly to maintain their plant, invest in new equipment and modern appliances, and make that return upon capital which is necessary to attract the additional investment required for improvement and extension of the railways of the country.

GRAPHICAL RATING OF SIMPLE LOCOMOTIVES

By G. S. CRITES

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Working time tables usually devote a page or so giving maximum rating of locomotives on the various freight divisions or subdivisions covered by the time table. These tables serve

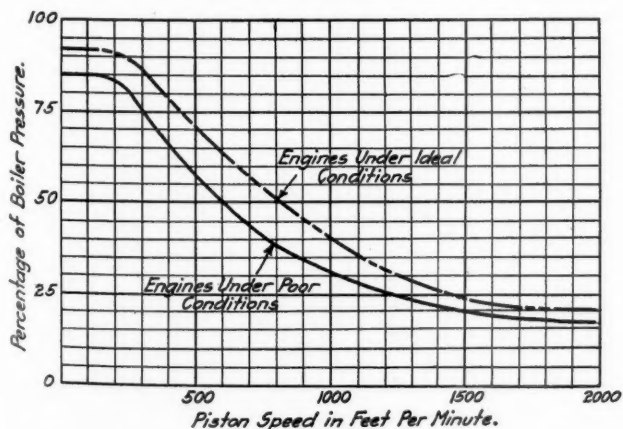


Fig. 1—Mean Effective Pressure in Cylinders of Simple Locomotive in Percentage of Boiler Pressure

their purpose well, but occasionally the operating man desires to know what a certain class of engine will do with 500 tons more or less than its maximum rating for the run. Graphically this information can be given in a very concise form, convenient to place in the note book or carry in the pocket.

In obtaining the data for plotting the two rating charts, Fig. 2 and Fig. 3, the lower curve shown in Fig. 1, giving the ratio of mean effective pressure in cylinders of simple locomotives to boiler pressure at various piston speeds, is used. The upper curve in Fig. 1 would apply to locomotives with ideal grate area, heating surface, fuel and firing conditions, and also to loco-

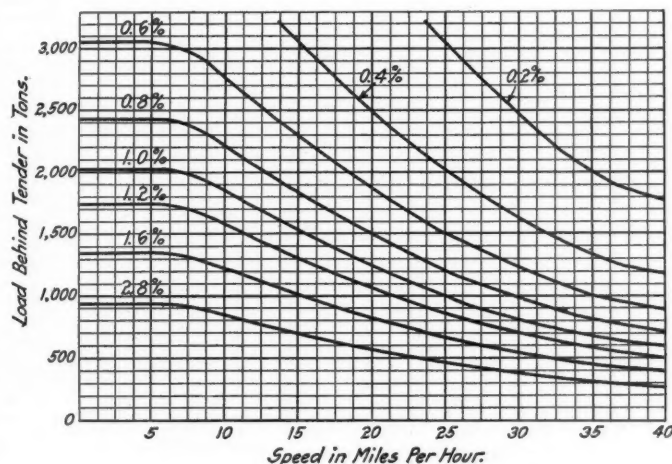


Fig. 2—Rating of Mikado Type Locomotive on Various Grades with 50-Ton Cars

motives under less ideal conditions, equipped with superheaters. The curve used will apply to locomotives with less than average heating qualities.

Recent dynamometer tests, under actual running conditions, show that the resistance of freight cars varies as to the capacity of the cars and not with their speed; that is, the resistance is practically constant for all ordinary speeds. The dynamometer shows that the resistance of a 50-ton car is 2 lb. per 1,000 lb., while the resistance of a 30-ton car is 2.9 lb. per 1,000 lb., and that of light empty cars may reach 5 lb. per 1,000 lb. Car re-

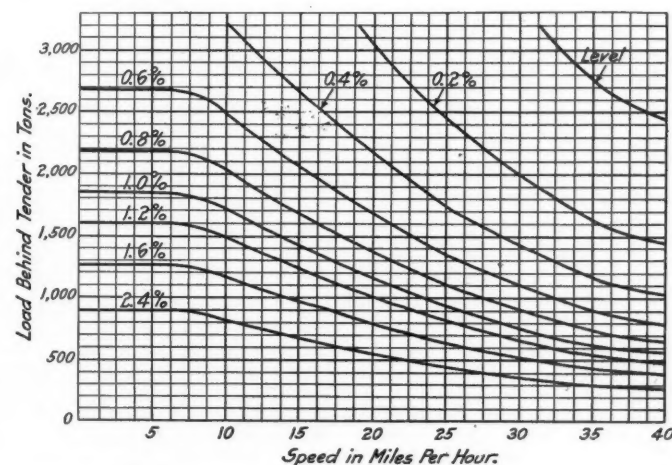


Fig. 3—Rating of Mikado Type Locomotive on Various Grades with 30-Ton Cars

sistance of 2 and 2.9 lb. per 1,000 lb. respectively, is used in plotting Fig. 2 and Fig. 3.

The sample tables, Fig. 2 and Fig. 3, are for a 2-8-2 engine with weight on drivers of 216,500 lb., weight of engine 275,000 lb., weight on trailer and trucks 58,500 lb., weight of loaded tender 130,000 lb., diameter of drivers 63 in., boiler pressure 185 lb., diameter of cylinders 26 in., stroke 30 in., and maximum trac-

tive effort 50,620 lb. (obtained by using 85 per cent of the boiler pressure as indicated by the lower curve of Fig. 1 and not the 92 per cent of the upper curve). The resistance of the engine parts is taken as 1.11 per cent of the weight on the drivers or 2,400 lb., and the resistance of the weight on trucks, trailer and tender is taken at 2 lb. per 1,000 lb. Head air resistance is taken as $.002 \times V^2 \times A$, where V = speed in miles per hour and A = head area of locomotive, or 120 sq. ft.

OBSERVATIONS ON FINISHING TEMPERATURES AND PROPERTIES OF RAILS*

By G. K. BURGESS, J. J. CROWE, H. S. RAWDON AND R. G. WALTEBERG
Bureau of Standards

The main objects of this investigation were to determine, from measurements taken in representative rail mills, the present American practice regarding the temperatures at which rails are rolled; to demonstrate the ease and accuracy with which such temperatures may be measured; to find out what the "shrinkage clause" in rail specifications really means; and finally to determine for rail steels some of the physical properties, particularly those of interest in manufacture and some of which, it would seem, are not sufficiently well known as yet. Among these last are the expansion, melting ranges, critical ranges and temperature distribution throughout a rail section on cooling.

In the spring of 1913, observations were taken of ingot and finishing temperatures of rails in four representative mills, designated as A, B, C, D. Temperatures were taken with the Holborn-Kurlbaum type of Morse optical pyrometer.

In Table 1 is given a summary of the temperatures of ingots as measured at the blooming mill during rolling for rails, and in Table 2 a summary of finishing temperatures of rails.

TABLE 1—SUMMARY OF INGOT TEMPERATURES AT BLOOMING MILL

Mill	Number of ingots observed	Average temp. C.	Average time in blooming mill, seconds	Remarks
A....	20	1140±10	120±25	Excessive time in pits.
B....	19	1082±16	121±16	In pits 1 hr. 35 m. to 2 hrs.
C....	29	1102±12	91±7	Two heats.
D....	43	1087±17	71±3	Two heats.
		1118±15	37±2.3	Seven heats.

TABLE 2—SUMMARY OF RAIL FINISHING TEMPERATURES

Mill	A		B		C	D
	Hot saw		Hot saw		Cooling bed No. 1	Just before hot saws
Location of station.....	4		5		3	1
Distance last pass to station.....	120		312		171	186
Number of rails.....	75		72		90	100
Weight of rails.....	Bessemer		O. H.		O. H.	Bessemer and O. H.
Type of rail.....	O. H.		O. H.		O. H.	Mean of A, B, C, D.
Letters indicate location of rails in ingot.....	A & D	A & D	A & C	A = 957 ± 8	A & D	Mean of A, B, C, D.
	924 ± 13	976 ± 10	988 ± 23	B = 945 ± 9	911 ± 8	Bessemer
	B & E	B & E	B & D	C = 935 ± 9	B & E	1047 ± 8
	918 ± 13	964 ± 12	962 ± 24	D = 923 ± 9	901 ± 8	Mean of A, B, C, D.
	C & F	C & F	.....	E = 951 ± 8	C & F	O. H.
	906 ± 15	942 ± 7	.....	F = 937 ± 10	883 ± 8	992 ± 15
				G = 920 ± 9	A & D	
				H = 903 ± 11	928 ± 6	
				Mean A, B, C, D, 939 ± 9	B & E	
				Mean E, F, G, H, 928 ± 9	920 ± 7	
					C & F	
					904 ± 8	

Table 3 illustrates with what uniformity of temperature it is possible to carry out the rolling of rails in practice. The letters

*This is a summary of a paper to be published shortly in full as a technologic paper of the Bureau of Standards with the following contents: 1. Introduction; 2. Importance of Limiting Temperatures of Rolling Rails; 3. Methods of Measuring Rail Temperatures; 4. Wickhorst's Experiments; 5. Measurements of Ingot and Finishing Temperatures; 6. The Samples and Chemical Analyses; 7. Mechanical Properties of Rails; 8. Melting Temperatures of Rail Steels; 9. The Critical Ranges of Rail Steels; 10. Observations on the Microstructure; 11. Temperature Distribution in a Cooling Rail; 12. The Expansion of Rail Steels; 13. The "Shrinkage Clause" in Rail Specifications; 14. Summary and Conclusions.

refer to the position of the rail in the ingot. It is evident that a uniformity of ±10 deg. C. may be maintained.

TABLE 3—MEASUREMENT OF TEMPERATURES OF HEAD OF RAIL AT HOT SAWS FOR 72 LB. RAILS

A	B	C	D	Mean				E	F	G	H	Mean			
				A	B	C	D					E	F	G	H
954	942	942	926	941	954	943	926	896	930						
966	953	948	928	943	965	945	919	898	932						
956	955	943	917	943	954	931	919	902	927						
958	945	926	929	939	952	944	920	906	923						
966	960	943	932	950	960	...	922	905	929						
968	945	940	929	945	954	940	920	901	929						
943	931	918	914	927	...	...	...	...	...	
...	...	...	...	...	948	933	918	908	919						
958	951	937	929	944	948	929	918	894	922						
962	923	920	917	928	940	920	908	894	915						
942	934	922	908	912	940	920	902	878	904						
922	912	908	887	907	926	906	894	872	902						
922	909	899	897	907	912	897	882	866	889						
926	917	905	897	912	926	903	902	882	904						
NEW HEAT															
953	947	935	920	938	932	931	913	903	920						
966	954	932	912	939	954	937	929	...	940						
954	945	934	922	938	954	945	922	914	934						
956	957	936	919	941	960	952	935	918	941						
964	949	934	926	943	954	943	...	913	936						
963	957	945	934	951	949	929	915	...	930						
952	943	937	930	940	950	943	924	920	934						
962	958	940	936	951	957	940	934	910	935						
966	957	940	932	949	951	934	918	897	924						
954	943	935	926	939	938	937	918	896	922						
956	943	929	922	936	955	943	922	901	930						
968	954	943	931	947	958	943	924	916	935						
964	946	943	935	946	964	952	932	913	942						
958	943	943	931	944	965	946	931	920	940						
960	946	944	931	945	946	943	926	918	934						
961	954	946	930	947	954	943	935	918	938						
958	949	945	943	949	957	935	931	920	936						
955	947	939	929	943	945	942	932	908	931						
965	953	939	939	949	968	953	941	917	945						
963	942	932	919	939	958	936	919	907	930						
962	951	937	919	943	957	940	912	896	927						
943	937	922	914	929	945	922	908	901	920						
960	944	943	929	944	966	957	932	908	940						
969	954	946	931	950	964	944	928	912	936						
975	962	953	934	957	954	952	920	908	934						
957	939	928	908	933	946	931	916	888	921						

*957 ± 8 945 ± 9 935 ± 9 923 ± 9 939 ± 9 951 ± 8 937 ± 10 920 ± 9 903 ± 11 928 ± 9

*This line represents the mean degrees of temperature of above table.

An inspection of the tables shows that there is practical uniformity among the several mills for the rolling temperatures of ingots for steel rails, the range being from 1,080 deg. C. (1,975 deg. F.) to 1,140 deg. C. (2,085 deg. F.). With the exception of the Bessemer rails of Mill D, rolled at an average temperature of 1,047 deg. C. (1,917 deg. F.), there is no very considerable difference among the finishing temperatures of the rails as ob-

served at the hot saws for the several mills, the range being about 880 deg. C. (1,615 deg. F.) to 990 deg. C. (1,815 deg. F.); or, in other words, the four mills all finished their rails to within 50 deg. C. of 935 deg. C. (1,715 deg. F.) on the average, excepting the Bessemer rails of Mill D. This temperature of 935 deg. C. is 270 deg. C. (520 deg. F.) above the mean value, 665 deg. C. (1,230 deg. F.) of the critical ranges of these rail steels. Concerning the distribution of temperatures within the head of a cooling rail, it is shown that the center of the head is some

50 deg. C. (120 deg. F.) to 60 deg. C. hotter than the optical pyrometer reading at 935 deg. C.; therefore the center of the head is finished, on the average, at about 325 deg. C. (615 deg. F.) above the critical range for 100 lb. sections.

The tables of finishing temperatures show several other facts of interest. For example, it is evident that it is a possible and easy operation to determine accurately the temperature of each rail length in succession as it arrives at the hot saw. (See Table 3.) From the measurements at Mill A, the relative temperatures of rails differing in weight of section, rolled from ingots having closely the same weights and temperatures, are shown. Thus the average of the finishing temperatures of the top rails (A and D or A and C) for 100, 90 and 75 lb. sections were, respectively, 988 deg., 976 deg. and 924 deg., and similarly for the others.

Chemical analyses and microphotographic examinations were also made and the mechanical properties determined for a number of samples of rail the rolling of which had been observed. From a comparison of these few observations, there appears to be not a sufficient degree of correlation to warrant associating very specifically any of the characteristics defined by these three methods of examination, either with the temperatures of rolling here observed or with each other.

The following thermal properties of these rail steels were determined in the laboratory: The critical range on heating is located (maximum) to within 7 deg. C. of 732 deg. C. (1,350 deg. F.) for the ten samples of O. H. and Bessemer steels examined. On cooling, the critical range lies between the limits 680 deg. C. (1,256 deg. F.) and 650 deg. C. (1,202 deg. F.). The melting or freezing range for rail steel extends from about 1,470 deg. C. (2,680 deg. F.) to nearly the melting point of iron, located at 1,530 deg. C. (2,786 deg. F.).

The expansion for O. H. and Bessemer steels is not the same. Above 800 deg. C. (1,470 deg. F.) the expansion for both increases linearly with temperature and the linear coefficient per degree centigrade has the following mean values from 0 deg. to 1,000 deg. C.: (1) For Bessemer steel (carbon .40 to .50 per cent.) = 0.0000146, (2) for open hearth steel (carbon .65 to .70 per cent.) = 0.0000156.

The average composition of the Bessemer steel was carbon = 0.40 to 0.50 and manganese = 0.76 to 0.93; of the open hearth steel, carbon = 0.66 to 0.70 and manganese = 0.66 to 0.72.

In 1909 the American Society for Testing Materials limited the shrinkage allowance on 100 lb. sections to $6\frac{3}{4}$ in. in 33 ft., or to an equivalent of 1,947 deg. F. (1,064 deg. C.) for O. H. and 2,055 deg. F. (1,124 deg. C.) for Bessemer rails. This specification is still in force.

A rail of 100 lb. section in cooling freely in air from a uniform temperature of 1,070 deg. C. (1,960 deg. F.) reaches its recalescence point at 670 deg. C. (1,238 deg. F.) in about 8 min. 30 sec. The maximum difference in temperature between the center and outside of the head during this cooling is about 85 deg. C. at 1,000 deg. C. (1,832 deg. F.), drops to 55 deg. at 900 deg. C. and to 30 deg. at 800 deg. C., becoming 0 deg. again at 670 deg. C.

A comparison of the shrinkage clause in American rail specifications (for example, those of the A. S. T. M.) with the expansion of rail steel shows that this clause permits finishing rails at 1,120 deg. C. (2,045 deg. F.), or 450 deg. C. (840 deg. F.) above the critical range of rail steel, and above the temperature at which many ingots for rails are actually rolled in practice and well above the practice of the rail mills for finishing temperatures, as shown in Table 2. Such a shrinkage clause therefore does not serve the avowed purpose of limiting the finishing temperatures to a value slightly above the critical range.

In conclusion, it should be emphasized that the various series of observations recorded in this investigation are of but a preliminary nature and do not pretend to solve the question of the relations between temperature of rolling and the properties of rails. It would seem desirable to make a much more complete and comprehensive study of the various matters mentioned

and of related questions than has hitherto been attempted, and on a scale commensurate with the importance to the community of the problem of sound rails.

THE PREJUDICE AGAINST THE RAILWAYS*

By FAIRFAX HARRISON

President, Southern Railway

One who has been engaged in the railway industry practically all of his business life, who, relying on the candor of his intentions, has striven earnestly and laboriously to achieve progressive improvement in the efficiency of *personnel* and *matériel* of the service, who has always been actuated by a determination to adjust his business practice to what he understands to be the public expectation, who believes that fair dealing and frank discussion are the surest means of success, but who has not for a moment lost sight of the fact that a railway is not an eleemosynary institution: that its purpose is the reward of those who have adventured their capital as well as to serve the public; such a one, I say (and I know that there are many), must sometimes pause to take account of the undoubted fact that for some years there has been a steady growth of public disapprobation of his profession.

I venture to claim that no American boy begins life criticizing and condemning the railways. On the contrary, most inland boys have their imagination and ambition first stirred by the physical aspect of life on the rail. They see the train crews at work, they admire the demonstration of mighty power and the shining beauty of the locomotives: they hear tales of manly hardship and derring-do such as quicken the heart beats of every one with red blood in his veins and so they make heroes of those men of the throttle and the lantern who come periodically out of the great unknown into the narrow confines of their young lives to go again like migrating birds to mysterious "points South," which are only names to the untraveled lad. The railroad is to the inland boy what the ship is to the boy born at a seaport—the outward and visible sign of a world of adventure.

So it is that many boys cherish an ambition some day to work on the railway and they believe it to be an honorable plan for an honorable and useful life. It is only later when the germs of an endemic social malady invade the system that that blind and, at times, apparently unrelenting hatred of the railway corporation, of which for years we have had frequent demonstration, feeds itself in the average man upon all the temptations of personal selfishness, upon the cant phrases of the ambitious demagogue, upon the poisoned political economy of the muckraking magazine, to blaze, with orgiastic fury, in laws and regulations, such as no virile man would ever accept for the conduct of his own private business. When he thinks of such things and his conscience works, as it sometimes does, the average man justifies himself with belief that a "great" corporation can submit to oppression and injustice, or can adjust its business practices to methods which an individual could not brook. He finds his justification then somewhat in mere size of the sacrificial victim. But there are two more potent causes of his discontent, viz.: a latent inherited class prejudice, and the remoteness of management.

Of these causes of current misunderstanding, the last named—remoteness of management—is the one which, in my judgment, best justifies much of the criticism of the railways.

There are few American men who would lend themselves to the despoiling of their immediate neighbors. We all know how public opinion regards those who do that thing. I know, too, that where communities are acquainted with the men who manage the railways and respect them in their personal lives and bearing, the pressure of hatred of what they represent is less. The psychology of this is not, however, as simple as it would seem to be. Most railway managers have experienced a curious

*An address before the Chamber of Commerce, Lynchburg, Va., on April 30.

differentiation in the public mind between the individual reputation of the officer and opinion of his official acts. That which is hated is not the man who exercises the power and who makes the determination which the public considers unreasonable, but the impalpable thing known as "the Company," which somehow is distinguished from the officers and even from the stockholders, who choose the officers. This seems to be the explanation of the reluctance of juries to impose criminal responsibility upon officers for their corporate proceedings. We must here recognize a prejudice, for the character of a corporation is neither better nor worse than that of its responsible manager, and it must follow that, as the character of the manager is understood, opinion of him will more and more displace preconceived opinion of the corporation.

I deem it, therefore, an obvious duty upon those who have the responsibility of the management of our railways to spend as much of their time as they can in cultivating friendly and human relations with the communities they serve. They can do, and for several years the best of the American railway managers have done, much to plant the seeds of understanding and mutual forbearance by studying at first hand the point of view of the shipper and by revealing themselves as human men seeking to do their duty under difficulties.

So far as railway managers are concerned, it is not necessary to look into the past. If they were once arrogant and arbitrary and aloof, as a class, all the world knows that they were chastened by an outraged public opinion and the heavy hand of the law. Those who typified the sins of the past have mostly passed away. Few of them reaped the crop of tares which grew on the fields they cultivated. They have been succeeded by another generation—men who have been from boyhood in the railway service, as distinguished from the control of the railways, who have been all their lives in contact with the people, who are actuated by principles of service rather than oppressive exploitation of opportunity: but they find themselves in an environment of prejudice which was engendered not by themselves but by their predecessors. They are under the awful curse of Yahweh, "The sins of the fathers shall be visited upon the children." It is conceivable that the American people, ingrained though it may be with Hebrew traditions, will not apply this lash of serpents forever and without relenting. I believe that it is only necessary for them to become convinced that the present generation of railway managers is seeking simply to do their duty and to serve efficiently, to reinstate them in the high place in public esteem to which the nature and the importance of their service entitle such of them as do well. I have had opportunity to know the fellowship of the railway managers in the United States today, and, considering them as a class, I challenge any other class of the community to match them for courage, for unremitting labor, for high ambition and for good intention: and I believe that, as the public knows them, it will grant them the reward of good opinion and respect which I myself have for my colleagues in the service. They are men in the way literally to realize Ruskin's definition of an artist as "a person who has submitted to a law which it was painful to obey, that he may bestow a delight which it is gracious to bestow."

If, then, the American people and those who are charged with the active responsibility of management of our railways are in a fair way to do what the knights in the *Faery Queen* did after a soul searching combat—the poet says they usually "affriended"—I recognize a greater difficulty in solving that other factor in the problem of the railways, to which I have referred, namely: class hatred.

In speaking to a body of men engaged in those manifestations of industry known as manufacturing and distribution, I am speaking to men who in their own business experience are trained to understand the problem of management of a railroad. They have seen the railroads regulated: they have contributed for their own advantage to the creation of the public opinion which accomplished that regulation, and they have

largely harvested the fruits of that regulation: but they are now beginning to realize that they have unloosed a beast which is likely to raven at their own doors before it is chained, if ever again it is to be chained. The principle of the interference of government in private industry is not likely to be applied forever merely to railways, or even to those aggregations of other forms of industry known as trusts. We all feel every year more and more the hand of the government in our private affairs, and, unless the public conscience is diverted to something else, as it might be by a great and cruel war, which God forbid, we are likely to see a steady expansion of the domain of the sovereign (who, in our civilization, is evidenced by the representative legislature) on social questions affecting every man engaged in the management of industry, or the ownership of the tools of industry. That means the small manufacturer as well as the large manufacturer: the small employer of labor as well as the large employer of labor. At the moment this tendency, so far as it has been diverted from its earliest hostages—the managers of the railways—is directed towards that class of the community which is dim, mysterious and distant—the capitalist and his agent, the banker.

In a purely agricultural civilization, such as we find in large parts of the United States today, and such as persisted, until the beginning of the last century, practically all over the world, there is an inherited tradition of hostility to the banker. We find expression of it in our earliest records. When the Hebrew people lived exclusively upon agriculture, their law (Exodus 22:25) prohibited the taking of interest on a loan—what has been translated usury. The farmer could find no justification for such a practice, for he was then, as he is today, in the habit of lending what he has—his seed, his cattle, his tools—to a neighbor in temporary need, freely and without expectation of reward. He made his living in Biblical times, as he makes it today, by selling, not by lending, what he produced. This also was the sentiment of the primitive Romans, when they too were a purely agricultural people. In one of the earliest Latin books which have come down to us this same thought is expressed by old Cato the Censor, who, two thousand years ago, had felt the stirrings of what we call modern industry, of a far conducted commerce, but still apologized for the ancient prejudice of the farmer.

"The pursuits of commerce," says Cato, "would be as admirable as they are profitable if they were not subject to so great risks: and so likewise of banking, if it was always honestly conducted. For our ancestors considered, and so ordained in their laws, that, while the thief should be cast in double damages, the usurer should make fourfold restitution. From this we may judge how much less desirable a citizen they esteemed the banker than the thief."

At every session of Congress, at every meeting of a state legislature, we hear vocal expression of distrust and suspicion of the banking community, specifically what the popular imagination terms generically Wall street. One who has been constantly on the go, as I have in recent months, meeting people in many communities, realizes that this is a deep seated sentiment of the American people today. I do not intend to hold any brief for the bankers as a class. In the railway industry we have our own troubles, and the bankers are amply able to defend themselves, but I am glad of an opportunity to remind business men of what the banker means to us all under existing conditions.

Time was when it was generally believed that the railroads were making vast profits because they handled millions of revenues. Many there were who purported to disbelieve the statements of the published accounts: comparatively few there were who ever read them. It was enough to know that the figures dealt in millions to believe they were unholy. Then came the regulation of the system of railroad accounts, and with it an appreciation by most intelligent men that accounts kept under the supervision of a government commission were probably reasonably correct, and if they showed, as they did show, that

the profits were not large when reduced to the unit of investment represented, or of service performed, then resort must be had elsewhere to find the "nigger in the woodpile."

The American people are not yet entirely convinced that a railroad is a precarious industry subject to general economic laws, though they are rapidly coming to that appreciation. Because it has been demonstrated that there are thieves and buccaneers in the railway industry, as well as in most other forms of human activity, the popular search has always been to find whither have gone the vast "profits" which are believed by many to be a necessary incident of control of a system of railways. It now seems likely that publicity will demonstrate that this suspicion of all railroad bankers, like the suspicion of unlawful profits of the railroads themselves, is a delusion. The recent publication by a great banking house in New York of the details of its accounts with the New Haven Railroad revealed to an astonished world that over many years of the largest financial transactions the bankers' profits averaged seventeen thousand dollars per annum. This may well give us all pause in our preconceived opinions, and, in further aid of clear thinking as to your and my relations to the bankers, I venture to say in conclusion a word as to what these bankers do for you and for me.

Every one of you has a large personal interest in the perfection of the Southern Railway as an instrument of commerce. I myself have a personal ambition and a steady determination to accomplish every year a step towards the realization of your interest in this respect. To do that will require bringing into the south many millions of new money. We cannot hope to earn from our service to the southern people all that we need to spend on these railroads as fast as we must spend it. Even if we devoted all of our income to that end, and for many years we have so devoted most of it, the agricultural and industrial south is growing so fast that we could not keep up with it, much less keep ahead of it and so help it to grow. Neither is the south itself yet ready to provide the capital by buying our securities. Under the operation of the new income tax law we have had an opportunity, never before possible, to ascertain where and by whom many of our railway securities are held. In this way we have identified a certain representative block of one hundred and ten million dollars of Southern Railway bonds and find that they are held not only in New York but in most of the states of the United States and in many foreign countries and by nearly eleven thousand individuals. Of this total, less than three and a half million dollars is held by seven hundred individuals resident in the states the Southern Railway serves, and 60 per cent. of these holdings in the south are in the two cities of Richmond and Louisville. This demonstrates that the money we have secured for the improvement of the Southern Railway in the past has been drawn not from a few rich men, but from an army of investors having at stake an average of not much more than \$10,000 apiece, and that the south itself, which has had the benefit of the expenditure of the money in the promotion of an unexampled growth of prosperity, has as yet contributed only 3 per cent. of the capital.

Until the south is prepared to support our capital requirements on a larger scale, we must then look to those who have established channels for the facile distribution of large blocks of securities among a multitude of investors all over the world, and this necessity brings us inevitably to the banking community, to the hated Wall street, for access to the money we need to spend in the south.

I am glad to be assured that these bankers have realized that the south is the coming part of the United States, and so are confident that they can safely venture their reputation in distributing the securities of Southern Railway Company under present day conditions. I am glad, too, to believe that I have their personal confidence and that they will listen to my recommendations. They have already supplied fifteen million dollars of absolutely new money on such recommendation since the first of January last, and they are ready to supply more for further improvement of the Southern Railway plant. All of

this is to be spent for the south, most of it in the south, in such ways that eventually it will seep into the accounts of many southern merchants, just as the proceeds of a large crop eventually reach the merchants. Every one whom I now address has an interest in the disbursement of this money and in what will result in the way of personal convenience and facility for doing business from its expenditure. It is as if a new crop worth fifteen million dollars had been produced in the south this winter. Think what the rejoicing would have been if it had been a crop!

It is, then, of great importance to you and to me and to all the people of the south to have and to hold the confidence of these bankers. The way to accomplish that is simple. I do not propose an investigation of the bankers' business. I do not even propose a new statute to compel them to supply us with money: that might be the simplest way, but it appears that no investigation nor any statute has yet been devised to make a banker invest where he does not want to invest: such a miracle is apparently one of the few things which neither an investigation nor a statute can be made to perform. The bankers do not ask any gratitude, any lip service, for they expect to get their reward in the form of a commission: that is their business. They do not expect to control the railways as the popular imagination pictures them as doing: to make rates and initiate policies affecting the welfare of thousands of people. Never in my personal experience with them, and it has been an intense experience over many years, have I heard a suggestion of that kind of interference, nor have I experienced an attempt to exercise such power through the control of the sources of money.

In a prosperous community there is only one condition of the bankers' co-operation, but it is an essential one—that the public shall be as fair in the treatment of invested capital as it has demanded that those who control invested capital shall be fair to the public.

Personally, I have no doubt that we in the south shall meet the condition and get all the money we need.

EDUCATION OF COLLEGE STUDENTS ON THE CANADIAN PACIFIC

The general manager of the Canadian Pacific, A. D. MacTier, in furtherance of that company's well known arrangement for co-operating with McGill University, has issued a circular systematizing the course of instruction for the students while they are on the railroad, the substance of which is here quoted.

With a view to giving the students in the transportation course of McGill University the best possible experience during the periods of practical training, the following program of work has been arranged:

First Year (Vacation).—Three months as a special apprentice at the Angus shops. Second Year (Vacation).—Three months as a special apprentice at a roundhouse. Third Year (Vacation).—Three months in road service as an extra brakeman.

After Graduation.—Three months in station service; two months in stores department; three months in master mechanic's service; three months in accounting department; three months on track work; two months in car department; three months in yard office; five months in superintendent's office.

CLASS OF WORK TO BE GIVEN STUDENTS IN EACH COURSE

First Year (Vacation) Special Apprentice at Angus Shops.—First month in erecting shop; second month in frog and switch shops; third month on air brake and finishing locomotives.

Second Year (Vacation) Special Apprentice at a Roundhouse.—Three weeks with hostler—outside and inside; two weeks with boiler gang; three weeks with specialists in roundhouse; two weeks with fitters' helpers and engine trimmers. Balance of time in locomotive foreman's office.

Third Year (Vacation) Extra Brakeman.—Ten weeks in way freight service on a single-track subdivision where traffic is

fairly dense. Balance of time in through freight service on a single-track subdivision where traffic is heavy. In event of student choosing to fire, he will be placed on a busy single-track subdivision.

AFTER GRADUATION

Station Service; May, June and July.—Student to be placed at some small station, preferably at an interchange junction point, in order that he may get a general knowledge of the office, shed and platform work.

Stores Department, August and September.—One month at Angus stores, shipping material, receiving material, passing invoices, entering order book, packing material, making orders on shops, taking stock, way-billing material and handling correspondence. One month in stores at a divisional point, shipping material, receiving material, passing invoices, entering order book, packing material, making orders on shops, taking stock, way-billing material and handling correspondence.

Master Mechanic's Service. October, November and December.—To be used making investigation of reports on fuel consumption, engine failures, condition of engines, roundhouse operations, etc.

Accounting Department. January, February and March.—*First month.*—Standard method of payroll checking, and of preparing same, with instructions as to various procedures they are put through before being handed paymaster for payment; distribution of payroll items to various accounts according to classification, and posting in register of expenditure.

Vouchers.—Explanation of different kinds of vouchers with reasons therefor, with method of checking pay vouchers and listing and posting in voucher index and register of expenditure.

Material Reports.—Rails, fastenings, ties and bridge and building department reports, with method of distribution of charges for material reported used, shipped, received and released, and explanation of stock accounts.

Purchasing Department and Stores Department Invoices.—Method of record and distribution of charges thereon. Assist in closing out register of expenditure figures and preparing latter for balance sheet; assist in preparing personal and departmental bills, and record of charges to appropriation work. Balance of month on timekeeping.

Second Month.—To be kept on timekeeping until books closed and distribution made, then to be put on register of expenditure and remain until balance sheet finished, keeping in touch with material reports; make appropriation expenditure report; assist in preparing comparative report form 695; balance of month going over charges in transit (stock and other).

Third Month.—Pay rolls—General work, including correspondence, keeping in sight correspondence relating thereto, and scrutiny of previous year's figures. Vouchers.—General work, seeing that regular monthly accounts are in, and providing for accounts due but not yet rendered; preparing comparative pay roll figures form 235A with explanation; going into causes of increases or decreases; assist generally on material reports, register of expenditure, and all comparative statements, the latter to have preference so as to learn the causes of variations in expenditure.

Track Work. April, May and June.—Two months shimming, ditching, renewing ties, tamping, surfacing, gaging, lining track, etc. One month with track supervisor.

Car Department. July and August.—Two weeks with air brake instruction car—half the time to be spent in the car and half the time with local inspector. Four weeks at an interchange inspection point. Balance at an originating passenger terminal, one week of which inspection on car cleaning, and balance inspection on safety and repairs.

Yard Office. September, October and November.—Inside, car records; outside, car checking; ordering trains; compiling reports; enquiry desk.

Superintendent's Office. December, January, February, March and April.—First month on maintenance of way mat-

ters; second month with chief train despatcher in connection with car distribution, compilation of reports, etc. Third month on casualty work and train reports; fourth month on general office work; fifth month to be used by the assistant superintendent in outside work.

CAPITALIZATION OF THE RAILWAYS OF THE WORLD

The Bureau of Railway News and Statistics has issued the following:

"Although United States railways in 1912 comprised more than one-third the total mileage of the earth, their capital represented but little more than one-fourth of the entire investment in the world's railways. Average capital per mile of United States railways, in other words, was only slightly over three-quarters the average per mile of the entire world.

"How moderate capitalization of our railways is in comparison with most foreign countries is shown strikingly in the yearly figures of the Royal Prussian Department of Public Works.

"During the year 1912, according to these figures, approximately \$1,745,000,000 was added to the world's investment in railways, or an average of \$119,455 for every mile added to the total mileage during the year. This brought the aggregate capital of the world's railways at the end of 1912 to the gigantic sum of \$58,695,209,664. 'To give an idea of this sum,' says the German commentator, 'it may be remarked that a pile of 20 mark pieces (\$4.76) equaling this amount would have a height of 11,468 miles and that to carry this sum, likewise in 20 mark pieces, about 9,860 freight cars, each with a capacity of 10,000 lb. (11 tons), would be required.'

"For the United States, however, capital in 1911 is placed at \$19,200,000,000, or \$78,722 per mile. This is the erroneous gross capital which includes all duplications due to intercorporate ownership, and disregards the Interstate Commerce Commission's figure of \$15,000,000,000, or \$63,944 per mile, as the correct capital of United States railways. Making this correction, total world capital is \$54,502,553,664, or \$81,284 per mile, against \$63,944 in the United States.

"This places the United States eighteenth in the list of countries in order of capital per mile, though by a margin of more than 200,000 miles first in point of mileage. The countries which exceed the United States in capital per mile are, in order:

1. England	\$269,496	10. Spain	\$88,368
2. Belgium	189,023	11. Japan	84,301
3. France	143,435	12. Russia	83,486
4. Brazil	142,080	13. Holland	82,796
5. Italy	124,116	14. Serbia	73,373
6. Austria	120,311	15. Hungary	69,084
7. Switzerland	117,953	16. New South Wales	65,989
8. Germany	116,661	17. Algiers	64,019
9. Roumania	88,937	18. United States	63,944

"Some of these countries of higher capital have a narrow gage railways, while many others offer service and equipment which would not be tolerated in the United States. Only the following countries, continuing the order, are below our own railways in capital per mile, most of them being countries of very poor railway facilities, while for some the latest figures represent capital from 5 to 10 years ago:

19. Sumatra	\$60,885	31. East India	\$45,089
20. Denmark	59,683	32. Norway	43,256
21. Victoria	58,588	33. Cuba	42,624
22. Argentina	56,821	34. Tasmania	42,239
23. Uruguay	52,921	35. South Australia	39,928
24. Chile	52,480	36. Siam	38,681
25. New Zealand	52,206	37. Finland	36,864
26. Sweden	51,386	38. Lagos	33,792
27. Canada	50,952	39. Queensland	32,600
28. South Africa	50,380	40. West Australia	25,599
29. Gold Coast	49,152	41. Sierra Leone	20,582
30. Bulgaria	45,651		

"Europe retains by a large margin the leadership for the state-owned railways, 113,699 miles being under government ownership against 98,952 under private. North and South America have only 22,237 miles of state owned roads, against 321,406 of private. Australia has the largest proportion under

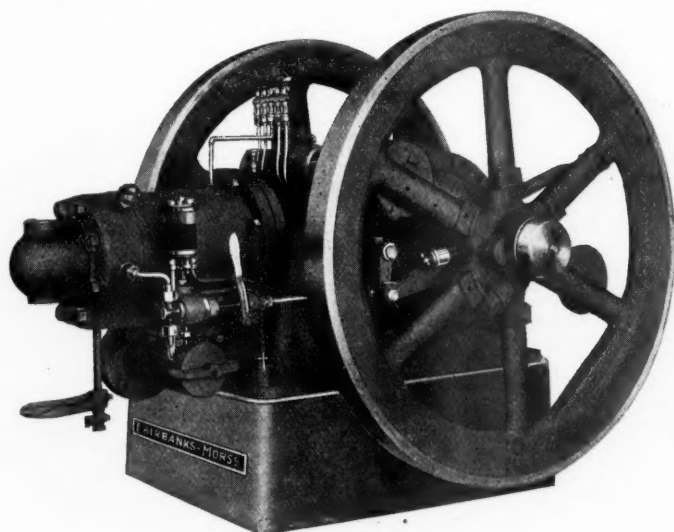
government ownership, 18,970 miles out of 21,578, while in Asia 43,840 out of 66,534 and in Africa 15,835 out of 26,491 are state-owned. For the world, private companies own 456,416 miles, or 68 per cent. of the total; governments 214,581 miles, or 32 per cent. of the total."

INTERNAL COMBUSTION ENGINE OPERATING ON CRUDE OIL

There has recently been placed on the market a type of internal combustion engine which operates on a large number of widely differing grades of crude and fuel oils. The same engine adjustment is used for all the oils.

The "hot-bulb" engine, as this type is known, occupies a position between the gasoline and the Diesel or heavier type of oil engine; that is, the degree of compression is greater than in the gasoline engine, but less than that employed in the Diesel engine. The latter, as is well known, has a high compression, amounting to about 450 lb., and generates a sufficient amount of heat during each stroke to automatically ignite the charge of fuel sprayed into the cylinder. This high compression, however, necessitates the use of compressed air machinery for the introduction of the fuel. The hot-bulb, or semi-Diesel type, with its lower compression of about 150 lb. per sq. in. does away with compressed air fuel injection. A fuel pump is used instead of the compressed air apparatus to inject the charge directly into the cylinder.

The degree of compression used in the new type of engine



The New Hot Bulb Internal Combustion Engine

does not supply sufficient heat to ignite a charge, but does completely vaporize the fuel. Ignition is accomplished by a hot bulb on each cylinder, these bulbs being kept at proper temperature, not by compression, but by the heat generated by the successive ignition of fuel charges.

In arrangement of parts the engine does not differ materially from other two-cycle types. Air is admitted through the enclosed crank case and forced into the cylinder under pressure, scavenging the burnt gases which remain there after the explosion. The mixture of air and fuel takes place in the heated cylinder, however, and not in the crank case.

In operation, the cycle of events is as follows: Shortly before the inner dead center is reached, and when the air in the cylinder is practically at its highest point of compression, a fine spray of fuel oil is forced into the combustion space. This fuel mixed with air is immediately ignited by the hot bulb. At the outer end of the stroke the burnt gases are expelled and a new supply of air is forced in from the crank case; the fuel is again injected at the inner end of the stroke.

The quantity of fuel injected into the cylinder governs the speed, and this amount is automatically regulated in such a way as to keep a speed that is practically constant. The fact that there is an impulse at every revolution, combined with the proper flywheel effect, is an important consideration in maintaining a constant angular velocity. This feature makes the engine especially well adapted for the operation of electric generators or other machinery that requires very close speed regulation.

The hot-bulb engine, as manufactured in this country by Fairbanks, Morse & Company, Chicago, operates on a wide range of fuels, either kerosene or crude oil, testing as low as 15 to 25 deg. Baumé. On these fuels it is claimed that the engine will operate continuously with a consumption of approximately one-tenth of a gallon per horse power hour.

THE ATLAS PRESSED STEEL TRUCK

A new pressed steel truck for freight house service has recently been placed on the market which has a large capacity and at the same time a light weight. In a little over a year's service in the Pittsburgh freight station of the Pennsylvania Lines West, 12 of these trucks have been put to severe tests without a break or defect. The trucks have also been used with satisfaction in the New Orleans cotton yards of the New Orleans & Northeastern and at various points on the Chicago & Alton; the Chicago, Rock Island & Pacific; the Wabash; the Illinois Central, and the Atchison, Topeka & Santa Fe.

The body of the Atlas truck is pressed from one piece of steel, eliminating bolts, rivets, etc. The body can be made either curved or flat and with strips for handling small packages if desired. Four standard types are made, one with a flat body and center strip riveted to the cross bars, one with



New All-Steel Truck

a curved body for barrels, one particularly adapted to handling cotton bales, and one with a curved body for handling rolls of paper or barrels. The wheels are of malleable iron, 12 in. in diameter with a 2 1/4 in. face. The hub of the wheel is fitted with a removable, flexible bearing to revolve with the wheel, the bearing springs being made so that they can be replaced with one of a little larger gage as the wheel wears. The axle is supported on both sides of each wheel, and the wheels are held in place by steel wearing washers. They can be equipped with rubber tires if desired.

The nose is made of malleable iron securely riveted to the body of the truck and the handles are of hard wood fastened in place by two lag screws. These handles are interchangeable and can be quickly replaced if broken. The legs are of angle iron, cold bent, and riveted to the sides and bottom of the body. The body of the truck is tested at 52,000 lb. Special tests have been made by dropping a weight of 5,600 lb. from a height of 2 ft. without damage to the truck. The weight of the various models varies between 120 and 130 lb. The height from the floor is 13 in., the width at the nose, 24 in., the width at the top bar, 23 in., and the length varies between 66 and 77 in. These trucks have been placed on the market by the Standard Scale & Supply Company, Chicago.

General News Department

Five thousand employees of the Baltimore & Ohio, from points east of Pittsburgh and Parkersburg, will hold their thirty-third annual reunion at Harper's Ferry, W. Va., on July 30.

George Bradshaw, safety engineer of the Grand Trunk Railway, and organizer of the "safety-first" committees of the road last year, has gone to Winnipeg to establish safety-first committees on the Grand Trunk Pacific.

Suit was filed in the United States District Court at Los Angeles, Cal., last week on behalf of the government to recover 107,999 acres of oil-bearing land from the Southern Pacific, the Standard Oil Company and 50 other corporations and individuals on the ground that it had been obtained in violation of the law.

On some, or all, of the New York Central lines, an order has been issued to the effect that all employees in the traffic department must take vacations of four days, each month, without pay. A similar order has been issued on the Pennsylvania, but applying, apparently, not to the traffic department, but to clerks in the general offices.

The American Wood Preservers' Association has issued a special circular describing the work of the association and its history, the industry it represents, and the exhibit at the Forest Products Exposition, which is declared to have been the greatest public demonstration of the preservative treatment of wood ever presented on the American continent.

In a decision rendered last week by the Court of Common Pleas at Cleveland, O., the title of the Pennsylvania and Lake Shore & Michigan Southern to submerged lands along the south shore of Lake Erie was sustained. Suit was brought on behalf of the state to secure title to submerged lands, and to enjoin the railroads from completing a fill west of the harbor entrance.

The Erie Railroad, when sued recently by a milkman for \$25,000 damages on account of an injury received when he drove his horse and wagon on to a highway crossing, and was struck by a locomotive, replied with a counter claim of \$100 for damage to the locomotive, declaring that the plaintiff had approached the crossing at a rapid, reckless and dangerous rate of speed.

Heavy rains on Sunday washed out railroad tracks in eastern Kansas and interrupted traffic on several lines. Near St. Joseph, Mo., Burlington trains were detoured because the bridge at Weston, Mo., went out, large stretches of track on the Atchison, Topeka & Santa Fe between Atchison and Topeka were washed away, and the Missouri Pacific lost a considerable amount of track between Atchison and Kansas City.

The musolophone is being installed in the new terminal station of the Canadian Pacific at Windsor street, Montreal. The "musolophone" is a telephone with a large receiver used to announce trains in the waiting rooms and other parts of the station, a single announcer talking into a telephone transmitter which is connected with as many receiving instruments as may be desired. It appears that devices of this kind, of three or more different makes, are now in experimental use in one or more cities. The device in the Grand Central Terminal, New York City, which was installed there two or three years ago, is now used only in the smaller rooms, the large central waiting room having developed such loud and troublesome echoes that the use of the telephone arrangement was given up.

Railroad Maps for Government Valuation

The Interstate Commerce Commission has issued a circular by which railways having an annual revenue of \$100,000 or over will be permitted to submit to the valuation board what maps they now have, in lieu of preparing new maps, provided they meet with the requirements of the order issued last February.

The roads are requested to collect such maps at some convenient point so that a representative of the commission may examine them. Ordinarily the commission will give three months' notice to a carrier whose property it intends to value, before the work is begun.

"As soon as the commission has passed upon the maps and profiles the carrier should proceed to make the changes or additions required in present maps and profiles or to prepare new ones, as the case may be. Carriers having no maps and profiles, or whose maps and profiles are clearly of such a character as to be insufficient for this work, should at once proceed to prepare those called for by the order of the commission.

"All carriers should at once prepare a list of their lands, showing grantor, grantee, instrument, etc., as called for in the order. If the carrier prefers, it may in the first instance prepare typewritten schedules which may be so arranged upon separate sheets as to be mechanically transferred to the maps finally. In the end the schedule of lands must appear upon the map as set forth in the order pertaining to maps and profiles."

Half a Million for a Simple Advertisement

The Union Pacific is to show at the Panama-Pacific International Exposition at San Francisco, next year, a reproduction of the notable features of Yellowstone National Park, and it has been estimated that the cost of the display will be \$500,000. This display will occupy four acres of ground near the eastern entrance to the exposition enclosure.

Psychic Effect of a Clock Face

The following is from a press despatch: The example of Cleveland in setting the clock ahead one hour, to conform to eastern time, in order to have one hour more of daylight for workers, is to be copied in Kenosha, Wis., for the reason, it is said, that the leading business people of the city want more time to devote to golf.

The factory owners are all golf enthusiasts, and they have proposed a plan to adopt eastern time so as to start their factories an hour earlier in the day and close an hour earlier in the afternoon.

This calls to mind the story of the dog, chasing himself around a tree, who bit off a piece of his tail to more surely provide for the adequate sustentation of his brain.

General Baggage Agents

At the annual convention of the American Association of General Baggage Agents, held last week in Detroit, Mich., the following officers were elected: President, George L. Alley, general baggage agent of the Union Pacific; vice-president, J. P. Dugan, general baggage agent of the Baltimore & Ohio; secretary-treasurer, J. E. Quick, general baggage agent, Grand Trunk (re-elected). It was decided to hold the next year's convention at Los Angeles.

Railway Special Agents

The International Association of Railway Special Agents and Police held its eighteenth annual convention at Norfolk, Va., June 16, 17 and 18. J. W. Connelly, chief special agent of the Southern Railway, Washington, D. C., was re-elected president of the association, and W. C. Pannell, Baltimore, Md., was re-elected secretary and treasurer. Cincinnati was chosen as the place for holding the convention in 1915.

Railway Fire Protection Association

The next annual meeting of the Railway Fire Protection Association will be held at Washington, D. C., beginning Oc-

tober 6. The executive committee will meet in the latter part of August or the first part of September to arrange the program and other details.

The Air Brake Association

The executive committee of the Air Brake Association has decided that the twenty-second annual convention of the association will be held on May 5 to 7, 1915, at the Hotel Sherman, Chicago.

MEETINGS AND CONVENTIONS

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

- AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.
- AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass.
- AMERICAN ASSOCIATION OF DINING CAR SUPERINTENDENTS.—H. C. Boardman, D. L. & W., Hoboken, N. J. Next convention, October, Washington.
- AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, 143 Liberty St., New York.
- AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, I. C. R. R., East St. Louis, Ill.
- AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, Room 101, Union Station, St. Louis, Mo. Next convention, August 20 and 21, New York.
- AMERICAN ELECTRIC RAILWAY ASSOCIATION.—E. B. Buttrick, 29 W. 39th St., New York. Annual convention, October 12-16, Atlantic City, N. J.
- AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—H. G. McConaughy, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.
- AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York.
- AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Next convention, October 20-22, 1914, Los Angeles, Cal.
- AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Next convention, March 16-18, 1915.
- AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Karpen Building, Chicago.
- AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga. Next convention, July 20-22, Hotel Sherman, Chicago.
- AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa. Next annual meeting, June 30 to July 4, Hotel Traymore, Atlantic City, N. J.
- AMERICAN SOCIETY OF CIVIL ENGINEERS.—Chas. W. Hunt, 220 West 57th St., New York; 1st and 3d Wed., except June, July and August, New York. Annual convention, June 3-5, Baltimore, Md.
- AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 11 Broadway, New York; 2d Thursday of each month, at 2 P. M., 11 Broadway, New York.
- AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York. June 16-19, St. Paul-Minneapolis, Minn.
- AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 19-21, 1915, Chicago.
- ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—E. R. Woodson, 1300 Pennsylvania Ave., Washington, D. C. Annual meeting, June 24, Minneapolis, Minn.
- ASSOCIATION OF RAILWAY CLAIM AGENTS.—C. W. Egan, B. & O., Baltimore, Md.
- ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June 12, Hotel Denis, Atlantic City, N. J. Annual convention, October 19-23, Chicago.
- ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago.
- ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York. Annual meeting, Hotel Chalfont, Atlantic City, N. J., June 18-19.
- ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y.
- BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—L. D. Mitchell, Detroit Graphite Co., Chicago, Ill. Meeting with American Railway Bridge and Building Association.
- CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and August, Windsor Hotel, Montreal.
- CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 176 Mansfield St., Montreal, Que.; 1st Thursday, October, November, December, February, March and April, Montreal.
- CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 Lawler Ave., Chicago; 2d Monday in month, except July and August, Lytton Bldg., Chicago.
- CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Fri. in Jan., May, Sept. and Nov. and 2d Thurs. in March, Hotel Statler, Buffalo, N. Y.
- CIVIL ENGINEERS SOCIETY OF ST. PAUL.—Edw. J. Dugan, P. O. Box 654, St. Paul, Minn.; 2d Monday, except June, July, August and September, Old State Capitol Bldg., St. Paul.
- ENGINEERS' SOCIETY OF PENNSYLVANIA.—Edw. R. Dasher, Box 75, Harrisburg, Pa.; 1st Friday after 10th of each month, except July and August, 31 So. Front St., Harrisburg, Pa.
- ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—Elmer K. Hiles, Oliver Bldg., Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.
- FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va.
- GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—A. M. Hunter, 605 Grand Central Station, Chicago; Wed. preceding 3d Thurs., Transportation Bldg., Chicago.
- INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.
- INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick Bldg., Chicago.
- INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 14-17, Hotel Sherman, Chicago.
- INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Next convention, third Tuesday in August.
- MAINTENANCE OF WAY AND MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—T. I. Goodwin, C. R. I. & P., Eldon, Mo. Next convention, November 17-19, 1914, Detroit, Mich.
- MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York.
- MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Karpen Building, Chicago.
- MASTER CAR & LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Next convention, September 8-11, Nashville, Tenn.
- NATIONAL RAILWAY APPLIANCES ASSOCIATION.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Next convention, March 15 to 19, 1915, Chicago.
- NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.
- NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.
- NIAGARA FRONTIER CAR MEN'S ASSOCIATION.—E. Frankenberger, 623 Brisbane Bldg., Buffalo, N. Y. Meetings monthly.
- PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Thursday in month, Jefferson Hotel, Peoria.
- RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.
- RAILROAD MASTER TINNERS, COPPERSMITHS & PIPEFITTERS' ASSOCIATION.—U. G. Thompson, C. & E. I., Danville, Ill.
- RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 30 Church St., New York.
- RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.
- RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.
- RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.
- RAILWAY FIRE PROTECTION ASSOCIATION.—C. B. Edwards, Mobile & Ohio, Mobile, Ala. Annual meeting, 1st Tuesday in October.
- RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo.
- RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Annual meeting, Bluff Point, N. Y., September 22-24.
- RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.
- RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 2136 Oliver Bldg., Pittsburgh, Pa. Meetings with M. C. B. and M. M. Associations. Atlantic City, June 10 to 17.
- RAILWAY TELEGRAPH & TELEPHONE APPLIANCE ASSOCIATION.—G. A. Nelson, 50 Church St., New York. Meetings with Assoc. of Ry. Teleg. Supts.
- RICHMOND RAILROAD CLUB.—F. O. Robinson, C. & O., Richmond, Va.; 2d Monday in month, except June, July and August.
- ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Next convention, September 8-10, 1914, Chicago.
- ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.
- SALT LAKE CITY TRANSPORTATION CLUB.—R. E. Rowland, Hotel Utah Bldg., Salt Lake City, Utah; 1st Saturday of each month, Salt Lake City.
- SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmunds, 3868 Park Ave., New York. Meeting with annual convention Railway Signal Association.
- SOCIETY OF RAILWAY FINANCIAL OFFICERS.—Carl Nyquist, La Salle St. Station, Chicago.
- SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Atlanta, Ga. Next meeting, July 16, Chattanooga, Tenn.
- SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant Bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., 10 A. M., Candler Bldg., Atlanta.
- TOLEDO TRANSPORTATION CLUB.—J. S. Marks, Agent, Interstate Despatch, Toledo, Ohio; 1st Saturday in month, Boddy House, Toledo.
- TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meetings with Roadmasters' and Maintenance of Way Association.
- TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.
- TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 291 Broadway, New York; last Tuesday in month, except June, July and August, Waldorf-Astoria, New York.
- TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie R. R., Pittsburgh, Pa.; meetings bimonthly, Pittsburgh. Annual meeting, 2d Monday in June.
- TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library Building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.
- TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7122 Stewart Ave., Chicago. Next convention, June 16, Jacksonville, Fla.
- TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.
- TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, Supt.'s office, L. S. & M. S., Detroit, Mich.; meetings monthly, Normandie Hotel, Detroit.
- TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Next meeting, September 15-18, Hotel Sherman, Chicago.
- UTAH SOCIETY OF ENGINEERS.—Frank W. Moore, Newhouse Bldg., Salt Lake City, Utah; 3d Friday of each month, except July and August, Consolidated Music Hall, Salt Lake City.
- WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.
- WESTERN RAILWAY CLUB.—J. W. Taylor, 1112 Karpen Building, Chicago; 3d Tuesday of each month, except June, July and August, Karpen Building, Chicago.
- WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; regular meeting 1st Monday in month, except January, July and August, Chicago. Extra meetings, except in July and August, generally on other Monday evenings.

RAILWAY AGE GAZETTE

1600

REVENUES AND EXPENSES OF RAILWAYS

TEN MONTHS OF FISCAL YEAR ENDING JUNE 30, 1914—CONTINUED

TEN MONTHS OF FISCAL YEAR ENDING JUNE 30, 1914—CONTINUED															
Name of road.	Average mileage operated during period.	Operating revenues			Maintenance of way and structures.		Operating expenses			Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decrease) comp. with last year.	
		Freight.	Passenger.	Total.	inc. misc. structures.	equipment.	Traffic.	Trans- portation.	General.						Total.
New York, New Haven & Hartford.....	2,007	\$26,895,521	\$22,830,025	\$55,258,412	\$7,036,622	\$8,519,611	\$93,525	\$22,877,178	\$1,490,059	\$40,316,995	\$14,941,417	\$79,772	\$2,990,000	\$12,031,189	—\$3,528,261
New York, Ontario & Western.....	566	5,657,708	1,443,543	7,470,125	1,078,262	1,349,106	102,608	2,944,880	167,247	5,642,103	1,828,022	—25,932	189,300	1,612,790	—593,325
New York, Philadelphia & Norfolk.....	112	2,462,786	4,358,928	6,821,714	3,113,156	672,596	49,621	1,425,864	140,218	2,561,631	85,800	463,725	188,643	31,521	—869,497
New York, Susquehanna & Western.....	141	1,748,400	4,358,928	6,107,328	2,455,359	313,979	22,577	1,045,842	69,035	1,728,876	726,383	—22,479	138,811	563,193	—869,497
Norfolk & Western.....	2,037	31,591,181	4,105,335	36,995,483	4,124,633	7,729,449	606,848	11,815,754	767,629	25,044,313	11,951,170	—15,448	1,340,000	10,595,722	—285,942
Norfolk Southern.....	860	2,275,379	797,870	3,330,315	497,980	474,461	58,557	1,213,819	174,082	2,418,899	911,416	—423	104,655	806,338	—545,000
Northern Central.....	472	8,180,322	2,098,415	11,022,932	1,419,020	2,516,240	168,929	5,507,777	280,285	9,893,131	1,129,781	6,113	410,376	724,500	—2,417,418
Northern Pacific.....	6,314	40,950,254	13,162,859	57,811,018	7,431,599	7,113,062	1,032,966	18,853,112	903,671	35,334,350	22,476,668	280,663	4,103,766	18,653,565	—59,532
Northern Railway.....	401	1,196,240	1,625,201	3,050,799	486,359	426,162	39,933	1,120,583	120,382	2,193,439	859,640	.....	72,199	707,844	—8,795
Oahu Ry. & Land Co.....	102	698,333	255,110	1,017,174	103,389	80,687	6,484	225,355	49,326	465,241	551,933	.....	72,199	479,734	—837,154
Oregon Short Line.....	2,120	13,280,026	4,143,329	18,641,388	2,294,841	2,730,600	361,451	4,746,794	541,694	10,315,380	8,326,008	—29,177	1,288,280	7,008,551	—549,655
Oregon-Washington R. R. & Nav. Co.....	1,915	9,460,112	4,113,132	14,633,109	2,055,278	1,419,020	492,193	5,106,244	594,130	9,996,941	4,636,156	—48,652	1,112,823	3,474,693	—31,800
Pecos & Northern Texas.....	570	1,525,661	380,414	2,019,888	280,673	364,270	28,134	6,291,428	67,498	1,295,732	724,156	.....	75,584	648,572	—1,613,356
Pennsylvania Co.....	1,750	37,656,919	8,481,059	46,137,978	7,169,232	7,839,709	875,548	19,243,179	1,224,254	38,856,922	12,246,342	—104,242	2,726,789	9,415,311	—2,897,393
Pennsylvania Railroad.....	4,044	108,469,542	31,563,396	150,801,972	19,969,908	31,361,481	2,095,555	56,721,436	3,814,885	113,963,265	36,838,767	—1,592,304	6,142,103	29,104,300	—1,205,988
Pere Marquette.....	2,322	9,396,296	3,326,829	13,947,722	2,129,110	3,388,459	342,499	6,121,012	418,124	12,399,204	1,548,518	—22,870	523,680	1,001,968	—1,780,249
Philadelphia & Reading.....	1,020	31,817,375	5,838,940	37,656,315	4,103,773	7,342,998	433,402	17,021,350	653,167	26,236,690	13,251,878	256,914	1,026,755	12,482,037	—3,880,089
Philadelphia, Baltimore & Washington.....	717	8,328,838	6,962,357	17,073,874	2,679,554	3,206,113	324,036	7,686,148	470,817	14,326,668	2,747,206	.....	543,985	2,203,221	—847,434
Pittsburgh & Lake Erie.....	224	12,873,759	1,513,405	14,387,164	1,914,569	1,562,692	160,479	3,896,462	298,156	9,138,601	5,775,968	3,652	582,885	5,189,431	—1,267,799
Pittsburgh, Cincinnati, Chic. & St. Louis.....	1,472	24,306,316	7,360,977	35,640,843	5,238,252	7,307,337	731,261	14,236,675	814,568	28,328,093	7,312,750	—6,690	1,578,897	5,727,163	—1,205,988
Pittsburgh, Shawmut & Northern.....	282	1,677,636	109,775	1,812,751	335,747	489,553	17,048	659,589	50,754	1,552,691	260,060	.....	18,295	241,765	—187,335
Port Reading.....	21	1,097,025	876,176	1,973,201	1,341,818	2,239	389	910,925	73,485	1,544,541	846,795	.....	136,000	502,158	—359,700
Richmond, Fredericksburg & Potomac.....	88	1,219,294	239,136	1,458,430	247,474	280,842	31,812	910,925	73,485	1,544,541	846,795	.....	81,780	749,328	—182,137
Rutland.....	468	1,624,550	1,052,837	3,088,623	352,688	588,351	90,955	1,250,007	61,539	1,173,725	187,516	.....	72,385	115,122	—40,698
St. Joseph & Grand Island.....	319	955,252	294,832	1,361,241	263,259	206,137	50,493	592,297	61,539	1,173,725	187,516	.....	72,385	115,122	—40,698
St. Louis & San Francisco.....	4,742	24,565,124	9,035,519	36,095,135	5,772,416	6,098,223	721,786	12,359,237	1,012,753	25,964,415	10,130,720	.....	1,181,269	8,949,451	—2,374,896
St. Louis, Brownsville & Mexico.....	518	1,347,641	723,874	2,259,501	485,890	443,962	48,962	864,981	1,101,291	1,753,414	506,087	.....	76,729	429,358	—54,738
St. Louis, Iron Mountain & Southern.....	3,365	20,721,537	5,329,158	28,023,254	3,704,790	4,293,535	540,028	8,338,853	743,306	17,820,512	10,202,742	—25,885	1,091,332	9,085,525	—34,738
St. Louis Merchants' Bridge Terminal.....	244	901,863	319,056	1,220,919	1,297,118	263,259	90,493	592,297	61,539	1,173,725	187,516	.....	60,516	185,906	—77,419
St. Louis, San Francisco & Texas.....	943	5,438,384	1,235,374	7,054,015	675,238	1,281,251	293,042	1,787,851	290,105	4,327,487	2,726,528	—13,044	323,217	2,390,267	—532,644
St. Louis Southwestern.....	811	2,624,360	1,045,019	3,961,582	988,352	974,860	135,481	1,677,137	207,305	3,952,135	9,447	.....	144,000	529,215	—174,323
St. Antonio & Aransas Pass.....	724	2,680,261	1,145,541	4,050,739	897,164	619,863	64,166	1,677,250	119,081	3,377,524	673,215	.....	184,000	529,215	—174,323
San Antonio & Aransas Pass.....	1,133	5,629,328	2,500,745	8,143,299	1,047,550	1,047,550	317,937	2,989,810	185,583	6,022,454	2,720,845	.....	428,636	261,324	—177,310
San Pedro, Los Angeles & Salt Lake.....	3,082	14,581,370	4,604,614	21,363,799	2,643,359	2,890,572	653,413	7,790,162	625,182	14,602,692	6,701,107	.....	825,000	5,862,662	—259,143
Seaboard.....	7,047	38,407,291	15,876,645	58,861,827	7,653,263	9,914,807	1,853,873	20,888,879	1,797,356	42,108,178	16,753,649	44,740	2,216,500	14,581,889	—982,467
Southern.....	281	658,032	375,399	1,120,939	246,372	108,884	24,840	464,231	40,382	884,909	236,040	.....	85,364	150,666	—136,449
Southern in Mississippi.....	179	903,103	155,145	1,106,259	126,676	126,676	12,616	246,372	24,840	464,231	40,382	.....	85,364	150,666	—136,449
Southern Kansas of Texas.....	6,487	45,629,132	25,213,944	76,589,175	8,913,506	10,921,782	1,582,757	22,091,043	2,313,754	45,822,844	30,766,331	970,083	4,224,309	27,512,105	—3,932,933
Southern Pacific Co.....	6,163	624,776	196,665	856,621	127,911	127,911	19,620	258,328	38,380	498,416	358,205	.....	35,425	322,780	—44,961
Spokane International.....	556	2,425,649	1,349,889	4,107,238	616,129	376,712	78,889	1,032,675	132,579	2,236,984	1,870,254	—2,205	534,000	1,334,049	—346,517
Spokane, Portland & Seattle.....	294	984,113	361,023	1,426,608	271,034	167,506	56,863	503,250	72,994	1,071,647	354,961	.....	281,598	590,463	—165,341
Tennessee Central.....	458	2,246,807	1,048,056	3,294,863	392,236	186,631	9,268	949,923	58,090	1,596,148	792,859	79,202	192,615	204,904	—124,416
Terminal R. R. Ass'n of St. Louis.....	34	2,246,807	1,048,056	3,294,863	392,236	186,631	9,268	949,923	58,090	1,596,148	792,859	79,202	192,615	204,904	—124,416
Texas & New Orleans.....	1,885	10,967,728	3,957,356	16,007,316	1,881,080	2,457,667	377,049	6,829,651	433,364	11,978,811	4,028,505	—37,850	606,541	3,384,114	—759,924
Texas & Pacific.....	446	4,041,712	551,147	4,844,402	852,880	1,005,940	81,313	1,936,668	106,989	3,983,790	860,612	5,227	209,631	645,754	—352,142
Toledo & Ohio Central.....	248	614,833	415,129	1,096,041	214,009	279,561	25,072	496,709	36,756	1,052,107	43,934	.....	60,800	150,666	—180,566
Toledo, Peoria & Western.....	451	3,296,097	308,482	3,844,204	395,648	520,438	164,940	1,499,022	92,459	2,672,057	1,172,147	.....	165,800	1,060,347	—31,866
Toledo, St. Louis & Western.....	429	1,501,379	455,548	2,047,833	2,047,833	537,287	99,999	1,009,924	122,564	2,071,957	174				

Traffic News

The Baltimore & Ohio has opened a new freight station at Long Island City, N. Y. It will be known as the Long Island City-Queensboro Terminal, and is at the foot of Thirteenth and Fourteenth streets.

The Grand Trunk has announced that on June 28 it will put a new fast train into service between Chicago, Toronto and Montreal, leaving Chicago at 5:45 p. m., arriving at Toronto at 8:35 the next morning, and at Montreal at 5:55 the same afternoon.

The fast freight train between Chicago and Atlanta, Ga., operated by the Illinois Central and the Nashville, Chattanooga & St. Louis, for the 12 days from May 23 to June 4 made an average record of 50 hours for the 850 miles, which means a rate of 17 miles an hour, including stops.

The Chicago Great Western has reduced the running time of its late night train from Chicago to St. Paul and Minneapolis by 45 minutes. The train now leaves Chicago at 11:30 p. m., instead of 11. A similar reduction was made in the time of the train from St. Paul and Minneapolis to Chicago.

A three-day excursion fare of \$5 for the round trip between Chicago and St. Louis was put into effect on June 19 by the Chicago & Alton, the Chicago & Eastern Illinois, the Illinois Central and the Wabash. The Alton announced the rate, and the other roads met it. The fare is 85 cents less than the regular one-way fare.

The Atchison, Topeka & Santa Fe has moved its Chicago city ticket office from 64 West Adams street to the Railway Exchange building, near Jackson boulevard. It is understood that this is the forerunner of a movement on the part of a number of railways to move their ticket offices from the district in which most of them are now located, on account of increasing rent.

The Adams Express Company has made a contract, for a short term, to do the express business on the Pere Marquette, the payments to the railroad company to be 45 per cent. of the total express receipts, the same as on the Lackawanna road, the contract for which was noticed last week. The Adams was also closed contracts with the Chicago & Milwaukee Electric, the Southern Indiana and the Cincinnati, Bluffton & Chicago.

New passenger tariffs, to go into effect July 1, have been filed by the Louisville & Nashville and the Nashville, Chattanooga & St. Louis, making reductions in interstate rates throughout Kentucky, Alabama and Georgia. The average reduction is said to amount to about 16 per cent. This change is made in pursuance of an agreement between the roads and the Tennessee State Railroad Commissioners, and for the purpose of putting the interstate rates more nearly on a level with those within the state of Tennessee.

The Division street freight transfer station of the Pennsylvania Railroad at Harrisburg, Pa., has recently been enlarged by the construction of new tracks and sheds to accommodate 80 additional cars. The capacity of the sheds is now more than 200 cars, and the increase in local business will require the service of at least 35 additional men. The freight transferred at this point consists of high class goods mostly for distribution in nearby towns. Much of this transfer was formerly handled at other towns in central Pennsylvania, but has been moved to Harrisburg because of its greater convenience as a central point. The new station will take care of much of the local transfer heretofore passing through the Mulberry street station.

The Connecticut Company, operating electric railways, has discontinued the transportation of mails on its cars, the reason given being that the postoffice department had refused to make reasonable increases in compensation to correspond with an increased amount of mail offered. Press despatches from Washington say that the postoffice department is disposed to punish the electric road for alleged disregard of its obligations to the government. The Connecticut company had asked to be relieved of side and terminal service at 54 stations, and for an order for-

bidding the loading of more than six pouches on any one car. It is said that the postoffice department offered to partly comply with the company's request, but no settlement was reached. The local postmasters have taken measures to have the mail carried from office to office by some other conveyance, probably automobiles on the highway. The Connecticut company operates on a number of lines radiating from Hartford, New Haven and other cities.

The New England Lines' Industrial Bureau

The New England Lines' Industrial Bureau, organized three years ago by the New Haven, the Boston & Maine and the Maine Central, reports that in the year ending April 30, 68 business establishments have been encouraged to locate or remain in New England, an increase of 119 per cent. over the number secured in the previous year. These 68 concerns represent an investment of \$4,010,050. These plants are still in their infancy, but they give employment to 3,542 persons. New England is more than holding her own, despite the inducements offered by other industrial sections. During the three years of the bureau's existence there have been over 6,500 personal interviews between its representatives and business men. Sixty addresses were delivered before trade organizations and agricultural boards. The work of the bureau has included the agricultural field. Largely as a result of its efforts there has been made available a supply of ground lime for the use of farmers at \$1.50 per ton. By this it is hoped to increase the yield of many New England farms, whose soil has been badly depleted in the 275 years some of them have been cultivated.

North Carolina Rates

The Interstate Commerce Commission held hearings at Norfolk, Va., last week to listen to the differences now pending between the railroads and the shippers of North Carolina, which have arisen in consequence of the reductions of intrastate rates recently made in that state.

The railroad companies announced their intention of revising their rates in such way as to eliminate nearly, if not all of the interstate rates to and from North Carolina that are in excess of the combinations of locals, and, in the light of this announcement, it was decided not to go further in the investigation of that matter until this revision is completed and submitted. Then, if there is still dissatisfaction which is deemed of sufficient magnitude to carry the question before the Interstate Commerce Commission, this course will be taken.

Chairman E. L. Travis, of the North Carolina Corporation Commission, was present at the hearing in the interest of North Carolina shippers. A petition of the railroads have been the occasion of the hearings, their request being for permission to continue to charge through freight rates to North Carolina points that exceed the combination on Norfolk. The Corporation Commission filed a contrary petition with the Interstate Commerce Commission.

New Elevator at Girard Point

The Pennsylvania Railroad has just put in operation its new 1,100,000 bushel grain elevator at Girard Point, Philadelphia, built at a cost of \$1,200,000. This elevator is made of concrete and steel. It is located at the mouth of the Schuylkill river within a few hundred yards of the main channel of the Delaware river. It is adjacent to a pier 900 ft. long, on both sides of which vessels can dock. Grain will be delivered to ships for export by a conveying gallery, which extends out to the end of the pier. Two hundred and forty cars of grain can be unloaded in ten hours, and the tracks accommodate 400 cars. Twelve cars can be discharged at once, and ocean steamers can be loaded at the rate of 60,000 bushels an hour.

The elevator has one of the largest grain driers in the country. It has a capacity of 3,000 bushels an hour; also the four largest grain cleaning machines in the country; 20,000 bushels can be cleaned in one hour.

To the east of the working house and connected to it by a concrete tunnel and bridge is the storage annex, consisting of 54 reinforced concrete circular tanks holding 13,000 bushels each. The 40 intermediate spaces have a capacity of about 3,300 bushels each. The storage annex has a capacity of more than 800,000 bushels.

Commission and Court News

INTERSTATE COMMERCE COMMISSION

Commissioner H. C. Hall will hold a hearing at Salt Lake City on July 20, on proposed advances in rates from the Missouri river to Colorado-Utah points, which have been suspended by the commission. The Salt Lake City Commercial Club Traffic Bureau is making extensive preparations to contest the advance.

Concentration Privilege

Rates on Cotton and Cotton Linters; Concentration Privilege Must Be Continued. Opinion by Commissioner McChord:

The proposed withdrawal by the St. Louis, Iron Mountain & Southern of concentration privilege at Little Rock, Conway and Morrilton, Ark., on cotton from points on the Arkansas Central and the restriction in that respect of shippers to Fort Smith and Van Buren, Ark., found not to have been justified. (30 I. C. C., 467.)

Coal Rates from Oak Hills, Colo.

Opinion by Commissioner Hall:

The commission finds that the carriers have not justified a set of proposed joint rates between the Denver & Salt Lake and the Chicago, Rock Island & Pacific on bituminous coal from Oak Hills, Colo., to destinations on the line of the Rock Island in Kansas, Nebraska and Missouri, and it is ordered that the rates from Oak Hills be made the same as those from the Walsenburg district. (30 I. C. C., 505.)

Lumber Rates to Knoxville, Tenn.

Opinion by Commissioner McChord:

The commission finds that the respondents have justified proposed increases in the rates on lumber to Knoxville, Tenn., from points on the Mobile division of the Southern Railway between Marion Junction and Mobile, Ala., and from points between Selma, Ala., and Meridian, Miss. It is further held that the carriers have justified an increase in the rates from Decatur and Sheffield, junction points on the Memphis division, but only to the extent of one cent per 100 lb. An increase in the rate from Huntsville, also a junction point on the same division, however, is refused. (30 I. C. C., 524.)

Toledo Grain Rates

Toledo Produce Exchange v. Ann Arbor Railroad et al. Opinion by Commissioner Meyer:

The questions involved in this matter were covered by a former decision which required the establishment, on September 15, 1913, of rates from Toledo to New York in the ratio of 78 to 60—60 representing the Buffalo rates and 78 the Toledo rates—on ex-lake grain, domestic or export, and on export grain and flour. A revision of the transit arrangements at Toledo was also suggested. There has since been a re-hearing in the case, but the complainant and the carriers have come to terms over a new set of rates, so that a formal decision on the part of the commission is not found necessary. (30 I. C. C., 498.)

Onion Rates to New York City

In re rates on onions from Chester, Florida, and other points in New York to Duane street station, New York City. Opinion by Commissioner Harlan:

The Erie for many years has handled more than one-half of the onions consumed in the New York market. During the last four months of 1913 it handled about 75 per cent. of the entire tonnage, a large part of which originated in Orange county, N. Y., and was transported through Jersey City on an interstate rate of 13 cents per 100 lb. and delivered at the road's Duane street station on the North river. The road has found that

shipments are so made that this terminal is often greatly congested and is therefore seeking to make delivery on this traffic at the Pavonia avenue station adjoining the ferry entrance in Jersey City and has attempted to cancel the delivery privileges at Duane street and to establish a new rate of 10 cents on onions from Orange county to Jersey City. Delivery must henceforth be accepted at the latter point and an allowance of 3 cents is provided for drayage and ferriage in lieu of lighterage, following the practice in connection with other products such as dressed meat, butter, etc. The commission is not of the belief that the change will prove detrimental to onion growers in Orange county and finds that the Erie should at least be allowed to test the results of the proposed new method of delivery. (30 I. C. C., 528.)

STATE COMMISSIONS

The Public Utility Commissioners of New Jersey have issued an order, to take effect July 6, requiring the New York, Susquehanna & Western to keep the outsides of its passenger cars reasonably clean. This is the road on which passengers have complained because the railroad dismissed its car cleaners some weeks ago, and one of whose trains was subjected to the indignity of having its windows washed by a company of citizens.

COURT NEWS

See editorial comment on the Supreme Court's decision in the Southern Pacific oil lands case and in the intermountain (long and short haul) case.

Judge McPherson of the United States District Court at Des Moines, Ia., on June 22, rendered a decision sustaining the constitutionality of the Iowa workmen's compensation act passed by the last general assembly to go into effect July 1.

The suit of the government against the Erie Railroad to have declared illegal the sending of a letter by the superintendent of telegraph to a station agent, without the payment of postage, did not succeed; the indictment has been dismissed. The station agent was joint agent for the railroad and the Western Union Telegraph Company, and the suit was prosecuted on the ground that the contents of the letter had to do with the telegraph business, not the railroad company's business; but the court (United States District Court, southern district of New York) held that as the railroad company participated in the receipts (and expenses) of the telegraph office, a communication from an officer of the road relating to the promotion of the telegraph business of the office was on the railroad company's business. The federal statute forbidding the transmission of letters on trains outside the mails without payment of postage, now expressly excepts letters on the "current business" of the road.

Pipe Lines Common Carriers

The Supreme Court of the United States in a decision, by Justice Holmes, handed down last Monday, holds that pipe lines for conveying oil across state lines are common carriers and as such are subject to regulation by the Interstate Commerce Commission, as provided by the Act to Regulate Commerce. Under the decision the Standard Oil Company will have to open up all of its pipe lines to competitors under rates to be regulated by the Interstate Commerce Commission.

Justice Holmes admitted that the pipe line amendment to the interstate commerce act was undoubtedly passed to meet a situation created by the Standard Oil Company's monopolization of pipe line facilities.

The decision exempts from the law a pipe line owned by the Uncle Sam Oil Company, which runs from the company's oil well in Oklahoma to its refinery in Kansas, the court finding that the pipe line was used by the company solely to conduct oil from its own wells to its own refinery. "It would be a perversion of language, considering the sense in which it is used in the statute, to say that a man was engaged in the transportation of water whenever he pumped a pail of water from his well to his house."

Justice Holmes' opinion was brief. He declared that Congress had the power to "require those who are common carriers in substance to become so in form."

He said there was no question whatever as to the right of Congress to regulate lines built in the future. As to those in existence at the time the pipe line law was passed he observed:

"Those lines are common carriers now in everything but form. They carry everybody's oil to a market, although they compel outsiders to sell it before taking it into their pipes. The answer to their objection is not that they may give up business, but that as applied to them the statute practically means no more than that they must give up a sale to themselves before carrying the oil they now receive.

"The whole case is that the pipe line companies, if they carry, must do it in a way that they do not like. There is no taking of private property and it does not become necessary to consider how far Congress could subject them to pecuniary loss without compensation in order to achieve the end in view."

Justice McKenna presented a dissenting opinion. He insisted that the exemption of the Uncle Sam company left the way open for the Standard to avoid the operation of the law. He asked if the Standard's lines would not be exempted, just as Uncle Sam's, if the Standard ceased to buy oil. "What then," he inquired, "would become of the independent producer?" The pipe line companies had done nothing outside of the exercise of the rights which all property owners possess, namely, to use their own property exclusively for themselves. The Standard Oil Company and its subsidiaries, which went into the Commerce Court and got an injunction against the Interstate Commerce Commission's order regulating the pipe lines, had based the petition for an injunction on the ground that the pipe line owners were being deprived of their property without due process of law.

Justice McKenna proceeded to discuss the rights of private property and the circumstances under which the government may step in and declare a public use in it. The Justice said:

"The companies have no right of eminent domain and their pipes are laid over private rights of way. They have never held themselves out as common carriers. The conception of property is exclusiveness—the rights of exclusive possession, enjoyment and disposition."

Justice McKenna suggested that under this decision a Washington business man who had provided exceptional facilities for the conduct of his business might be compelled to share them with a competitor. "There is quite a body of opinion which considers the individual ownership of property economically and politically wrong and insists upon a common ownership of all that is profit bearing."

Chief Justice White dissented to so much of the opinion as exempted the pipe line of the Uncle Sam Company and Justice McKenna joined in this dissent. The decision will not, however, exempt the pipe lines of the Uncle Sam Company from regulation by the Interstate Commerce Commission if that company should enter the field as a purchaser of oil for transportation in interstate commerce.

ELECTRIFICATION ON THE SWISS RAILWAYS.—The administration of the Swiss railways has drawn up a scheme for the adoption of electric traction on the St. Gothard Railway between Erstfeld and Bellinzona which it is estimated will cost \$7,400,000. Single phase current will be used at 15,000 volts; because it will be necessary to use steam and electric operation simultaneously during the conversion, a pressure of 7,500 volts will be adopted provisionally. It is stated that the scheme will permit the importation of coal to be reduced by two to three million tons a year. Battery locomotives charged at night will be used in the yards and for local traffic. There is plenty of water power in the neighborhood of the line.

RAILWAY ELECTRIFICATION IN PRUSSIA.—The Prussian State Railways have probably done more than all others to encourage electrification by the large amount of money they have spent on experimenting. The new principal installations are at present between Leipzig and Magdeburg, a distance of 100 miles, and the electrification of a modern railway in Silesia, a road of 81 miles in length. The total track mileage electrified by the Prussian State Railways, including the suburban system of Hamburg, amounts to nearly 400 miles, over which about 120 electric motor cars and 100 electric locomotives are operated. On the Halle and Magdeburg lines, speeds of 75 miles an hour are obtained and all express and local passenger, as well as freight trains, are handled electrically.

Railway Officers

Executive, Financial, Legal and Accounting

William A. Harriman, son of the late E. H. Harriman and a director of the Union Pacific, will on July 1 be elected vice-president in charge of the purchasing department, with headquarters at New York, succeeding W. V. S. Thorne, resigned. Mr. Thorne remains as a director of the company.

James F. Green has been appointed general attorney of the Missouri Pacific and St. Louis, Iron Mountain & Southern for the state of Missouri, exclusive of Jackson county, with headquarters at St. Louis, Mo., succeeding R. T. Railey, resigned. Mr. Green has been assistant general attorney for the Gould Lines at St. Louis.

John W. Everman, general superintendent of the Texas & Pacific at Dallas, Tex., has been appointed first vice-president and general manager of the Texas lines of the St. Louis Southwestern system and general manager of the system lines, with headquarters at Tyler, Tex. William N. Neff, first vice-president and general superintendent, has been granted leave of absence and the office of general superintendent is abolished.

Operating

R. J. McCarty, Jr., has been appointed general superintendent of the Greenwich & Johnsonville, with office at Greenwich, N. Y.

J. A. MacGregor has been appointed acting superintendent of the Second district, Alberta division of the Canadian Pacific, with office at Calgary, Alta., succeeding F. Walker, granted leave of absence.

J. D. Stack, until recently division superintendent of the Baltimore & Ohio Southwestern at Chillicothe, Ohio, has been appointed general superintendent of the Norfolk Southern, in charge of the departments of transportation and maintenance of equipment, succeeding W. A. Witt, who has been granted leave of absence.

C. L. Macmanus, whose appointment as demurrage supervisor for Texas for the American Railway Association, with headquarters at Dallas, Tex., has already been announced in these

columns, was born January 8, 1869, at Brownsville, Tex. He began railway work in 1889 in the auditor's office of the Mexican National at the city of Mexico. Subsequently until June 28, 1891, he was successively cashier for that road at Nuevo Laredo, Tex.; for the San Antonio & Aransas Pass and the Texas Mexican at Alice, Tex., and for the Mexican National at Monterey, Tex. He then went to the Monterey & Mexican Gulf at Tampico, Mex., as chief clerk, and in September, 1892, was made agent at that place. He was transferred to Trevino, Mex., as agent in February, 1893, resigning in June to go to the Mexican International at Jaral, Mex. He returned to the Monterey & Mexican Gulf at Tampico in January, 1894, leaving six months later to become cashier for the Gulf, Colorado & Santa Fe at Cameron, Tex. He remained with that road until July, 1910, successively as agent at Cameron, Temple and Dallas, seven years of which time he also was agent of the Rock Island Lines at Dallas. Mr. Macmanus then entered the service of the Frisco lines at Brownsville as general agent of the



C. L. Macmanus

St. Louis, Brownsville & Mexico. Later he was appointed also agent for the Brownsville & Matamoros Bridge Company and the Rio Grande Valley Railway, and in June, 1912, was made also vice-president and general manager of the latter road. He held these positions until his recent appointment on May 1 as demurrage supervisor for Texas, as above noted.

Traffic

T. H. Lawrence, chief clerk to the general freight and passenger agent of the St. Louis Southwestern, has been appointed assistant general passenger agent at Tyler, Tex.

C. L. Hilleary has resigned as general agent of the New York Central Lines at St. Louis, Mo., to become traffic manager of the F. W. Woolworth Company, with headquarters at New York.

J. O. Jones, traveling passenger agent of the Southern Railway at Raleigh, N. C., has been transferred as traveling passenger agent, to Charlotte, and O. F. York, passenger and ticket agent at Greensboro, has been promoted to traveling passenger agent, with office at Raleigh.

C. B. Austin, commercial agent of the Western Maryland, at Youngstown, Ohio, has been appointed a general agent of the freight department, with headquarters at Cleveland, succeeding Brent Arnold, Jr., resigned, and J. A. S. Wallace, traveling freight agent at Cumberland, Md., succeeds Mr. Austin.

H. B. Sperry, assistant general freight agent of the Missouri, Kansas & Texas at Dallas, Tex., has been transferred to Kansas City, Mo., in a similar capacity, succeeding J. C. Finch, resigned to engage in other business. F. G. Abbey, chief clerk in the office of general freight agent at Dallas, succeeds Mr. Sperry.

Rufus M. Pile, assistant general passenger agent of the Pennsylvania Railroad, with headquarters at Philadelphia, Pa., will be retired on July 1, under the pension rules of the company, after a service of more than 44 years on the Pennsylvania system. Mr. Pile was born on June 25, 1844, at Jeffersonville, Ind., and was educated in the high school of his native town. He began railway work in May, 1865, as a clerk in the general ticket office of the Jeffersonville, Madison & Indianapolis, now the Louisville division of the Pittsburgh, Cincinnati, Chicago & St. Louis. He was subsequently made chief clerk, and then served for several months as acting general ticket agent of that road. On June 1, 1873, he was appointed rate and division clerk in the passenger department of the Pennsylvania Railroad at Philadelphia, Pa., and ten years later, was promoted to chief clerk to the assistant general passenger agent. In November, 1888, he was appointed chief clerk to the general passenger agent, remaining in that position until June 1, 1903, when he was promoted to assistant general passenger agent of the same road.

Engineering and Rolling Stock

Hans Olsen has been appointed assistant roadmaster of the Northern Pacific at Staples, Minn.

The headquarters of E. W. Newcomb, signal engineer of the Oregon Short Line, have been removed from Ogden, Utah, to Salt Lake City.

C. Whitfield has been appointed general roadmaster of the Colorado lines, of the Denver & Rio Grande, with headquarters at Denver, Colo., succeeding J. H. Conlan, resigned.

William T. Kuhn, whose appointment as superintendent of motive power of the Toronto, Hamilton & Buffalo, with office at Hamilton, Ont., has previously been announced in these columns, was born in 1872 at East Radford, Va. He was educated at the Radford high school and took the complete mechanical course in the Scranton Correspondence School. He began railroad work in 1888 on the Norfolk & Western as an apprentice machinist. In the following two years he worked as machinist, roundhouse foreman and assistant air brake instructor. In 1900 he went to the Lake Shore & Michigan Southern as roundhouse foreman, and later was made mechanical inspector, with duties which included the inspection of new locomotives. In March, 1911, he was appointed assistant master mechanic of the Lake Erie & Western, and in October of the same year went to the Toronto, Hamilton & Buffalo as master mechanic, which position he held until his present appointment.

Purchasing

Ernest Baxter has been appointed purchasing agent of the St. Louis Southwestern, with headquarters at St. Louis, Mo., succeeding J. E. Sargeant.

OBITUARY

A. C. Sheldon, general agent of the Chicago, Burlington & Quincy at Portland, Ore., died in that city June 11, aged 68 years.

M. C. Kimball, district freight agent of the Minneapolis, St. Paul & Sault Ste. Marie at Grand Rapids, Mich., died in that city on June 12, aged 50 years.

Frederic Cromwell, formerly a member of the board of managers of the Delaware & Hudson Company, and a director of the Atlanta & Charlotte Air Line, the Morris & Essex, the Sixth Avenue Elevated Railroad, the Worcester, Nashua & Rochester and the New York Dock Company, died on June 22, at his summer home at Mendham, N. J., at the age of 71.

Martin M. Reynolds, vice-president of the Grand Trunk and the Grand Trunk Pacific, with headquarters at Montreal, Que.; died on June 17, at Old Point Comfort, Va. Previous to February, 1892, Mr. Reynolds was auditor of the Mexican National, and had been connected with that road for 11 years.



M. M. Reynolds

He then went to the Central Vermont Railroad as general auditor. From March, 1896, to April, 1899, he was auditor for the receivers of the same road, and in May, 1899, was appointed auditor of its successor, the Central Vermont Railway. In October, 1902, he was appointed controller of the National Railroad of Mexico, and from April, 1904, to April, 1908, was controller of the same road, also the Mexican International and the Inter-oceanic of Mexico; these lines are now part of the National Railways of Mexico. Mr. Reynolds went to the Grand Trunk in April, 1908, as vice-president of that road and affiliated companies, and later was elected vice-president also of the Grand Trunk Pacific and subsidiary companies in charge of the financial and accounting departments and of the Central Vermont.

CHINESE RAILWAY PROGRESS IN 1913.—In the year 1913, the government of the Chinese Republic granted approval for the construction of approximately 3,800 miles of railway, a distance almost two-thirds as great as that of the railways which have been constructed and placed in operation since 1876. At the end of 1912, China had no more than 6,000 miles in operation, with some 2,000 odd miles under construction.

ENGLISH CHANNEL TRAFFIC.—Complaint has sometimes been made with regard to the arrangements for cross-channel passengers who have not traveled from London by the boat trains to reach the steamers. At present some of the boats call at Dover Town to take up such passengers, and in view of the long distance which these passengers would have to walk, while the steamers are berthed at Admiralty pier extension, this is a great convenience. When the new Chatham and South Eastern station is opened for traffic, Dover Town passengers will use a footbridge which has been constructed alongside the Admiralty pier, a part of which is already in use. Of course the great majority of the passengers will exchange direct between trains and boats, nearly the whole of the cross-channel traffic consisting of through passengers.

Equipment and Supplies

LOCOMOTIVE BUILDING

THE CHICAGO JUNCTION is in the market for 5 switching locomotives.

THE KANSAS CITY SOUTHERN is in the market for 30 locomotives.

THE MINNEAPOLIS & ST. LOUIS is in the market for 20 mikado type locomotives.

THE WESTERN MARYLAND has revived a former inquiry for 20 freight locomotives.

THE SEABOARD AIR LINE has ordered 20 mikado and 10 mountain type locomotives from the American Locomotive Company.

THE NEWBURGH & SOUTH SHORE has ordered one superheater switching locomotive from the Baldwin Locomotive Works.

THE BINGHAM & GARFIELD has ordered one superheater consolidation type locomotive from the American Locomotive Company.

THE UNITED RAILWAYS OF HAVANA have ordered 3 saddle-tank six-wheel switching locomotives from the Lima Locomotive Corporation.

THE CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS has given the American Locomotive Company an order to convert 49 consolidation type locomotives to mikado type.

THE TAMPA & GULF COAST has ordered 3 ten-wheel locomotives from the Baldwin Locomotive Works. These locomotives will have 19 by 26 in. cylinders, 62 in. driving wheels and a steam pressure of 200 lb. They will be equipped with the Walschaert valve gear.

CAR BUILDING

THE ALCOLU RAILROAD is in the market for 50 box cars.

THE CHICAGO JUNCTION is in the market for 500 underframes.

THE CHICAGO & ILLINOIS MIDLAND is in the market for 250 steel coal cars.

THE CHARLOTTE, HARBOR & NORTHERN has ordered 30 phosphate cars from the Pressed Steel Car Company.

THE LAKE CHAMPLAIN & MORIAH has ordered 20 steel hopper cars from the Pressed Steel Car Company.

THE PITTSBURGH & SHAWMUT has ordered 750 all steel hopper cars from the American Car & Foundry Company.

THE DELAWARE, LACKAWANNA & WESTERN is in the market for 55 all-steel coaches for suburban service and 200 mine cars.

THE ATLANTIC COAST LINE is reported to have ordered 100 logging cars from the Cambria Steel Company. This item has not been confirmed.

THE HAVANA CENTRAL has ordered 100 underframes and 350 flat, 40 caboose and 20 box cars from the Standard Steel Car Company and 40 narrow gage cars from the Magur Car Company. The same road is also in the market for 6 motor coaches.

THE SEABOARD AIR LINE has ordered 500 box cars, 15 coaches and 7 postal, 5 combination mail and baggage, 9 combination passenger and baggage and 9 express cars from the Pressed Steel Car Company. The passenger train cars will be of all steel construction.

THE ILLINOIS CENTRAL has ordered 2,000 box cars in addition to the 3,000 box cars recently placed. The new order has been divided equally among the American Car & Foundry Company, the Pressed Steel Car Company, the Haskell & Barker Car Company and the Standard Steel Car Company.

THE NEW YORK CENTRAL LINES have now placed orders for 3,400 box cars with the American Car & Foundry Company, and 3,000 gondola cars with the Standard Steel Car Company. Of these, 2,500 box and 2,500 gondola cars will be used by the Cleve-

land, Cincinnati, Chicago & St. Louis and 900 box and 500 gondola cars by the Boston & Albany. Orders have also been placed for 2,000 refrigerator cars to be built in the shops of the Merchants Despatch Refrigerator Company, and it is reported that the New York Central is still in the market for about 4,000 cars, 2,000 of which will be bought for the Toledo & Ohio Central, and a number for the New York Central & Hudson River, itself.

IRON AND STEEL

THE INTER-MOUNTAIN has ordered 266 tons of bridge material from the American Bridge Company for girder spans over the Boise river, Boise, Idaho.

THE CHICAGO & NORTH WESTERN has ordered 1,220 tons of material from the American Bridge Company for a bridge over the Chicago river, near the Deering station.

SIGNALING

Train Staff System Without Station Attendants

The Long Island has contracted with the Union Switch & Signal Company for the installation of controlled manual blocking and staff system on its single track Whitestone branch between Whitestone Junction and Whitestone Landing. This branch is approximately five miles in length, the stations, in order, being Whitestone Junction, Flushing, College Point, Whitestone and Whitestone Landing. It will be divided into three blocks, one controlled manual, and two staff. The controlled manual block will extend from Whitestone Junction to Flushing, and arrangements will be made for suitable control of the signals by the existing mechanical bridge protection at the Flushing creek drawbridge. The signals will be style B semaphores, three-position, and the track circuits will be alternating current.

The train staff system will extend from Flushing to Whitestone Landing, which section will be divided into two staff blocks, with a junction staff instrument at Whitestone station. The use of this junction instrument will allow a train to take the siding at this point and remain therein until trains entering the block from either direction have passed out of the section between College Point and Whitestone Landing. The system is being arranged to be controlled either by operators at the staff stations or to work under the "automatic" system of staff control, in which no operators are required in the stations, the conductors of trains taking the staffs out of the pillars, preparatory to entering a section, and putting them into the pillar on reaching the outgoing end.

SPANISH STATE RAILWAYS, RESULTS.—The slow and costly methods of construction and the operating results of the lines undertaken and operated by the Spanish government, have not escaped adverse criticism from the Spanish press. Generally speaking, railway progress in Spain has been very backward, there being now the small total of 14,000 kilometers in actual use. Of this total, including lines under construction, the state owns about 500 kilometers, 390 of which are of 5 ft. 6 in. gage, and the remainder of meter gage. Notwithstanding that this small proportion was carried out under favorable physical and financial conditions, the unit cost of construction and the average time taken to complete the various sections are challenged on the ground that they are not only excessive, but unreasonable, since the state would not permit the dilatory and expensive methods in the practice of private undertakings. In view of this, the advocates of nationalization are being asked not to entrust a larger percentage of the problems of railway construction and transportation to state management, since the much needed speeding up of trains in order to develop the agricultural and other resources of the country would never be realized in the lifetime of the present generation. The Spanish state lines in 1912 just barely made expenses. On the other hand, the financial results of the private lines during 1912 were quite satisfactory, notwithstanding the difficulties they have had to meet. Iniquitous government taxation, together with the difference in gage, which isolates the peninsula from other progressive nations, are among the serious checks on the company's development and expansion. The gage question is now receiving influential attention and the government is being urged to cooperate in order to bring about unification.

Supply Trade News

The U. S. Metal & Manufacturing Company, New York City, has discontinued its eastern agency with the Pollak Steel Company of Cincinnati.

James M. Swank, at one time editor of *Iron Age* and formerly vice-president and general manager of the American Iron & Steel Association, died at his home in Philadelphia on June 22.

The Southern Pacific has given the Electric Storage Battery Company, Philadelphia, Pa., an additional order for 650 sets of "Ironclad-Exide" batteries for locomotive headlight service.

George C. Isbester, for the past three years attached to the New York office of The Rail Joint Company, has been given charge of the company's Chicago office, No. 215 Railway Exchange.

C. H. McCormick, formerly district manager of the Standard Heat & Ventilation Company, Cincinnati, Ohio, has been promoted to the position of vice-president, with office at 1949 Peoples Gas building, Chicago, effective July 1, 1914.

J. H. Johnson has resigned from his position as secretary and treasurer of the Union Switch & Signal Company, effective June 16. T. W. Siemon has been elected secretary and treasurer to succeed him, and assumes his new duties on June 19.

TRADE PUBLICATIONS

LOCOMOTIVES—The Walter A. Zelnicker Supply Company, St. Louis, Mo., has issued bulletin No. 54, describing a 35-ton 6-wheel and a 45-ton mogul locomotive which the company has for sale.

GUN-CRETE—The Gun-Crete Company, Chicago, has recently issued bulletin No. 1, a four-page folder describing the composition, uses and method of application of "gun-crete" or concrete applied by the cement-gun process.

HOT MIXER—The T. L. Smith Co., Milwaukee, Wis., have just issued a little leaflet illustrating and describing the Smith Hot Mixer. This mixer consists of the standard Smith Mixer on a truck with steam engine and boiler equipped with side loader.

WROUGHT IRON AND STEEL—The Reading Iron Company, Reading, Pa., has recently issued a pamphlet containing a review of the fundamental facts about wrought iron and steel and their relation to corrosion, including numerous abstracts from technical papers covering this subject.

GRAND TRUNK PACIFIC—This company has issued a new edition of its "Plateau and Valley Lands of British Columbia." This little booklet is intended to supply information to colonists who are considering settling in Grand Trunk Pacific territory. The booklet is very well written and well illustrated.

CHICAGO & NORTH WESTERN—The passenger department has issued an attractive booklet, on "Lakes and Resorts of the Northwest," in which are described the numerous resorts of Wisconsin, Michigan and Minnesota. It also gives complete information regarding hotel and transportation rates and facilities.

AIR COMPRESSORS AND VACUUM PUMPS—The Mesta Machine Company, Pittsburgh, Pa., has issued bulletin N, an eight-page pamphlet describing its air compressors and vacuum pumps. It also shows indicator cards, taken on a test run under given conditions, and curves giving volumetric efficiency as obtained from these cards.

RAIL JOINTS—The Railway Accessories Company, Seattle, Wash., has issued an elaborate booklet devoted to the design and mechanical construction of the Wightman mechanically-welded rail joint. The booklet enumerates the essentials of satisfactory rail fastenings, and by means of illustrations shows how the "mechanically-welded" joint meets these demands. Numerous letters from users of these fastenings are included.

Railway Construction

ALABAMA GREAT SOUTHERN—This company will soon let contracts, it is said, for double tracking work between Birmingham, Ala., and Mobile Junction, also between York, Ala., and Meridian, Miss. (January 30, p. 253.)

ALABAMA ROADS (Electric)—Plans are under consideration, it is said, for building an electric line from Mobile, Ala., to Pensacola, Fla. H. L. Misamore, Fairhope, Ala., is interested.

CANADIAN PACIFIC—The line from Glen Tay, Ont., via Belleville to Agincourt, has been opened for business and through trains are now being operated between Smiths Falls and Toronto over the new line. On the Saskatchewan division, the Shaunavon sub-division has been opened for business from Assiniboia, Sask., west to Shaunavon, 118.5 miles.

CHARDON, JEFFERSON & MEADVILLE INTERURBAN—An officer writes that the Public Utilities Commission of Ohio has authorized an issue of \$425,000 of bonds and \$300,000 of common stock to secure funds for the construction work on this line. Surveys have been made, and franchises and a private right of way have been secured from Chardon, Ohio, northeast via Hampden, Footville, East Trumbull, Rock Creek and Eagleville to Jefferson, 30 miles. Preliminary work for an extension from Jefferson east to Linesville, Pa., about 20 miles, will be taken up at once. The work calls for the excavation of about 150,000 cu. yd. of earth and 20,000 cu. yd. of rock. There will be a 100-ft. steel bridge on the line. The maximum grade will be 5 per cent., and the maximum curvature 10 deg. C. H. Felton, 735 Williams building, Cleveland, Ohio, may be addressed.

CRESCENT CITY—This road has been extended from Bloomington, Cal., to Rialto, 3.2 miles.

GREENE COUNTY—This road has been extended from Good Hope, Ga., to Monroe, 7 miles. (October 31, p. 844.)

ILLINOIS CENTRAL—An officer writes regarding the grade reduction work to be carried out between Princeton, Ky., and Paducah on the Kentucky division, for which contracts have been let recently, that the work involves the extension of the yard at Princeton, necessitating the handling of about 120,000 cu. yd. of material. This contract has been given to H. C. Hodges, Birmingham, Ala. The work at Iron Hill involves the reduction of grades and change of alignment of about five miles of track, necessitating the removal of about 500,000 cu. yd. of material, contract let to the Walsh Construction Company, Davenport, Iowa. The work at Dulaney and at Grand Rivers involves a slight change of alignment and reduction of grades and involves handling about 500,000 cu. yd., contract let to Winston Brothers Company, Minneapolis, Minn. (June 19, p. 1565.)

LA SALLE TERMINAL—A location survey is being made for this proposed seven-mile industrial line in the La Salle, Ill., district. It will connect the La Salle & Bureau County with the Chicago, Milwaukee & St. Paul and will afford transportation facilities for the Mathewson & Hegler zinc refinery, the German-American Cement Company and the Chicago-Portland Cement Company. This line will cross the Little Vermillion creek, the Chicago, Rock Island & Pacific tracks, the Illinois river and the Big Vermillion creek. Isham, Randolph & Co., Chicago, are engineers.

MISSOURI ROADS (Electric)—According to press reports, F. S. Mordaunt of Chicago, and capitalists of that city, are back of a project to build an electric line from Fulton, Mo., northeast to Montgomery City, about 40 miles. The line is eventually to be extended west to Columbia and south to Jefferson City.

MISSISSIPPI ROADS—Walter C. Murphy has entered into a contract with the Yazoo Commercial Club, it is said, to build a railway from Yazoo City, Miss., east to Carthage, about 60 miles. A bond issue of \$100,000 has been authorized by the city council, for the purpose of buying terminals and right of way.

NEW YORK SUBWAYS—The New York Public Service Commission, First district, has awarded the contract for the construction of section No. 7 of route No. 5, the Lexington avenue

subway in the borough of Manhattan, to the Rapid Transit Subway Construction Company, the lowest bidder, for \$1,915,164. This section covers that portion of the line in Lexington avenue between Forty-third and Fifty-third streets. Bids were opened on June 16 for the construction of section No. 1 of route No. 12, the Eastern Parkway subway in the borough of Brooklyn. The lowest bidder was the Cranford Company of Brooklyn, who offered to do the work for \$2,195,296.

NORTHWESTERN PACIFIC.—The Northern division has been extended from McCann, Cal., southeast to Fort Seward, 15.6 miles. (April 10, p. 831.)

NORTH & SOUTH RAILWAY.—Incorporated in Kansas to build from Wichita, Kan., north to Concordia and Washington, about 200 miles. The incorporators include J. R. Burton, Salina; P. H. Halleck and C. P. Estes, Abilene; D. W. Mulvane, Topeka, and C. Godman, Fort Smith, Ark.

OHIO ROADS.—The Cincinnati, Indiana & Ohio River Railroad Construction Company has been incorporated in Ohio with \$25,000 capital, it is said, to build a railroad between Cincinnati, Ohio, and Louisville, Ky. L. S. Cook, Cincinnati, is said to be interested.

PENNSYLVANIA RAILROAD.—The Shade Creek branch has been extended from its present terminus, at a point 1,100 ft. north of Cairnbrook, Pa., to a point 2,332 ft. south of Cairnbrook, 0.65 miles; the Berwind-White siding, 0.76 miles and a wye at Cairnbrook, with 550 ft. of tail track, have also been completed and are now operated as part of the Pittsburgh division.

PORT TOWNSEND & PUGET SOUND.—Incorporated in the state of Washington with \$250,000 capital to build a railway out of Port Townsend. The incorporators include C. G. Erickson, C. S. Shank, H. C. Belt and E. W. Bond, Port Townsend.

SOUTHERN RAILWAY.—An officer writes that a contract was recently given to Thrasher & Gunter, Knoxville, Tenn., to build an extension from Wauhatchie, Tenn., to the west portal of the tunnel built for the Memphis-Chattanooga Railway under Lookout mountain, near Chattanooga. The line will be 2.9 miles long. The maximum grade will be 0.5 per cent. and the maximum curvature, 2 deg. 30 min. The most important structure on the line will be a 370-ft. viaduct over Lookout creek. (March 6, p. 493.)

TARRANT COUNTY TRACTION COMPANY.—This company, formerly the Fort Worth Southern Traction Company, has filed with the Secretary of State at Austin, Tex., an amendment to its charter providing for an extension of the line from Cleburne to Denton and increasing the capital stock from \$1,500,000 to \$2,500,000. As announced in the *Railway Age Gazette*, July 21, 1907, the incorporators include C. H. Clifford, W. A. Hanger and W. C. Forbes, of Fort Worth.

TEXAS ROADS.—According to press reports, the Dallas Chamber of Commerce is interested in a project to build a line from Dallas, Tex., southeast to Palestine, about 105 miles. L. E. Mitchell, of St. Louis, Mo., is back of the project, and A. M. Matson, R. A. Ferris and J. R. Babcock, Dallas, Tex., are interested.

VICKSBURG, ALEXANDRIA & SOUTHERN.—Right of way has been secured, it is said, to build a line across the state of Louisiana, and a contract has been let for work on part of the line. The office of the company is at Alexandria. John F. Shepley, of the Union Trust Company, St. Louis, Mo., is president of the railroad company.

RAILWAY STRUCTURES

BUTLER, PA.—A viaduct, 1,050 ft. long, is to be built over the tracks of the Baltimore & Ohio and the Bessemer & Lake Erie, at McKean street, near Centre avenue. The metal bridge proper will be 741 ft. long, the remainder being approaches. The Pennsylvania Public Service Commission has issued its certificate of public convenience approving the location. The commission has also directed how the cost shall be apportioned, the first act of this kind of the new commission. The county is required to pay nothing at all. The cost, including damages to adjacent property owners and all necessary expenses, is apportioned: to the Borough of Butler, 20 per cent.; Baltimore & Ohio, 30 per cent.; Bessemer & Lake Erie, 30 per cent.; Butler Passenger

Railway Company, 10 per cent. It will be allowable, however, for the Passenger Railway to pay on the basis of tolls to the Borough.

DANVILLE, VA.—The Southern Railway has given a contract to I. C. Abbott, Brandy, Va., for building an extension 41 ft. by 43 ft., to the existing freight shed at Danville, Va., and the erection of an additional covered shed 41 ft. by 253 ft., with an open platform at the east end containing 2,400 sq. ft. of additional floor space. In addition, improvements will be carried out, including grading, track changes, paving, drainage and repairs to present facilities.

MOBILE, ALA.—The Southern Railway has been authorized to construct new freight houses, a storage yard and an engine yard at Mobile. The facilities for handling freight will consist of an outbound freight house, 26 ft. by 410 ft.; an inbound freight house, 40 ft. by 410 ft., with office 56 ft. by 134 ft.; cotton platform, 40 ft. by 330 ft.; ribbon platform, 12 ft. by 410 ft., and necessary tracks, team ways, drainage and paving with adequate fire protection. The work to be done in providing engine handling facilities will consist of grading, track work, cinder conveyor and the provision of drainage and water supply. A new storage yard with a 50 ft. track scale will also be provided. The work is to be started as soon as plans have been prepared and contract let. The track and yard work will be done by the company's forces specially organized for the purpose.

NORTH BIRMINGHAM, ALA.—The Southern Railway has begun the construction of the first unit of a two-way gravity classification yard on property already graded at North Birmingham, to be known as Finley yard. The track construction now under way is being handled by a special force organized for that purpose and will provide a receiving yard, gravity classification yard, a storage yard, and repair tracks. A yard office will also be built. There will also be constructed a 25-stall roundhouse of reinforced concrete construction with brick walls, and roof of concrete joist and tile. Contract for the roundhouse has been let to the Consolidated Engineering Company of Baltimore, Md. In addition the company will put up shop buildings, a modern coal, sand, and cinder handling station and track scales of heavy capacity. Complete arrangements will also be made for water supply, lighting, and fire protection.

PADUCAH, KY.—The Chicago, Burlington & Quincy is receiving bids for the construction of a new bridge over the Ohio river between Metropolis, Ill., and Paducah, Ky. The Nashville, Chattanooga & St. Louis is also interested.

PROVO, UTAH.—An officer of the Salt Lake & Utah writes that the company has finished work on a bridge over the Provo river consisting of two 50-ft. and one 30-ft. deck plate girders on concrete abutments and piers. The steel work was furnished by the American Bridge Company.

RICHMOND, VA.—The Southern Railway has begun work on new and enlarged freight yard and shop facilities at Richmond and South Richmond, Va. The work in Richmond proper will include the removal of the present passenger station at Fourteenth street, and the erection on its site of a new outbound freight house 40 ft. by 480 ft.; the conversion of one of the existing freight houses into an inbound freight house, and the other into a tobacco warehouse; the rearrangement of existing tracks and the construction of new tracks to serve all old as well as the new facilities, and the necessary paving and curbing around the new freight house. Bids are now being asked for the new freight station, which will be of brick construction, with tile roof over office part of the building and tar and gravel roof over the remainder. It will be divided as follows: First floor, offices 40 ft. by 40 ft.; warehouse, 40 ft. by 440 ft. Second floor, offices, 40 ft. by 150 ft. Under this new arrangement, the company's passenger trains which formerly arrived at and departed from the old Fourteenth street passenger station, are run into and out of Main street passenger station. The work at South Richmond will consist of the following improvements: New combination station at Hull street; team yard at Perry street; rearrangement of yard tracks to take switching of main line; four-track bridge over tracks at Seventh street; new main line from shops to connection with Seaboard Air Line; extension to roundhouse; extension to pattern house; new tender repair shop; modern coal, cinder and sand handling facilities; overhead walkway for employees; new track scales; new smoke jacks on roundhouse, and new yard office.

Railway Financial News

CHICAGO & INDIANA COAL RAILWAY.—Holders of the first mortgage 5 per cent. bonds of this company have appointed a protective committee, consisting of W. W. Jacobs, Hartford, Conn.; R. M. Carleton, of Blodgett & Company; Edwin S. Hunt, Waterbury, Conn., and J. S. Farlee, of J. S. Farlee & Company. The Central Trust Company of New York is depository for the bonds, on which it is understood the July interest is not to be paid. This road is a subsidiary of the Chicago & Eastern Illinois, 176 miles long.

CRANE RAILROAD.—See Lehigh & New England.

CHESAPEAKE & OHIO.—A press despatch from Frankford, Ky., says that the Elkhorn & Beaver Valley, a new line running from a point on the Chesapeake & Ohio in Floyd county into the coal fields, 21 miles, has concluded an operating agreement with the Chesapeake & Ohio.

CHICAGO, ROCK ISLAND & PACIFIC.—After a joint conference, attended by J. N. Wallace, president of the Central Trust Company, representing the bondholders' protective committee; William A. Read, representing the Phelps-Dodge interests and the stockholders' committee; James Brown, Bernard M. Baruch, Frederick Strauss and Albert Rathbone, the following outline of the tentative plan for reorganization was given out:

It was deemed unwise to continue the present holding companies or to reorganize through a new holding company. Accordingly the plan eliminates both holding companies with a gross capital of about \$357,000,000, and is based on the common stock of the old Chicago, Rock Island & Pacific Railway Company. The cash requirements of the railway company are provided by the issue of preferred stock of that company. Under the plan it is designed to raise about \$30,000,000 of new money for the purposes of the railway company, which is the amount estimated to be necessary for about three years, both by the chairman of the board of directors of the railway company and the expert employed by the bondholders' committee.

The limitations on the mortgaging powers of the railway company prevent the creation of a new mortgage for this purpose, and the plan contemplates, therefore, the creation of non-cumulative 7 per cent. preferred stock of the railway company, to be sold for cash with part of the existing common stock of the railway company.

Under the plan the trust indenture securing the collateral trust bonds now in default is to be foreclosed and the pledged common stock of the railway company purchased. Out of this common stock collateral trust bondholders are to retain, at par, 62½ per cent. of the face value of their bonds and the remainder of such common stock is to be offered for subscription with the new preferred stock. The bondholders thus retain 62½ per cent. of the stock deposited as collateral for their present bonds and part only with so much as is necessary to surrender in order to raise the funds required and to add value to the stock retained. In addition, the collateral trust bonds are to have the privilege (which they will be entitled to exercise or to sell as they may desire) to subscribe in cash an amount equal to 15 per cent. of the face amount of their bonds, receiving for such subscription 15 per cent. of the face amount of their bonds in preferred stock and 14 per cent. of the face amount of their bonds in existing common stock of the railway company. The stockholders of the Rock Island Company will be recognized through rights of subscription on the following terms:

To the holders of the preferred stock paying 15 per cent. par value of their stock in cash, 15 per cent. of such par value in new preferred stock, and 14 per cent. of such par value in the existing common stock of the railway company.

To the holders of common stock, paying 15 per cent. of the par value of their stock in cash, 15 per cent. of such par value in new preferred stock, and 10¾ per cent. of such

par value in the existing common stock of the railway company.

The collateral trust bondholders are also to have the preferential right to subscribe for and receive the preferred and common stock so offered for subscription to bondholders and stockholders and not taken by them, upon the average terms so offered to bondholders and stockholders, provided such subscription right shall be limited so that the common stock thereby acquired, together with all other common stock acquired by such bondholder under the plan, either through subscription or allotment, shall not at par value exceed the face amount of his deposited bonds.

The committees feel that it is wise and in the interests of all classes of security holders to eliminate the holding companies and to go back to the railway company. About \$357,000,000 par value of securities are eliminated, but all the equities in these securities are retained for their holders under the plan, and \$30,000,000 of new money is obtained by issue of new preferred stock for cash, the expenditure of which should greatly inure to the benefit of the property and of its security holders, and furthermore the way is cleared for future financing.

ELKHORN & BEAVER VALLEY.—See Chesapeake & Ohio.

LEHIGH & NEW ENGLAND.—The Pennsylvania Public Service Commission has given permission to this company to buy the capital stock of the Crane Railroad, which railroad the Lehigh & New England has been operating under a rental agreement.

PITTSBURGH, CINCINNATI, CHICAGO & ST. LOUIS.—The directors have passed the quarterly dividend on the common stock and declared half of 1 per cent. on the preferred stock. Previous to 1914 both the common and preferred stocks were on an annual basis of 5 per cent. In the first quarter of 1914 a quarterly dividend of 1 per cent. on the common and three-quarters of 1 per cent. on the preferred were declared. The present reduction, therefore, further reduces the annual rate on the two stocks to 2 per cent. on the preferred and nothing on the common.

ST. LOUIS & SAN FRANCISCO.—At an informal hearing Judge Sanborn, of the United States district court, has said that he would deny the application of the receivers to issue receivers' certificates to pay the \$1,371,000 interest due on the refunding bonds on July 1. The protective committee, of which Frederick Strauss, of J. & W. Seligman is chairman, representing the first and refunding mortgage bondholders, has announced that they will pay upon deposit of the bonds with the July 1 coupon attached the interest due on that day, and the committee binds itself not to agree to any plan of reorganization under which the expenses of this committee are to be a burden upon the refunding mortgage bondholders.

SOUTHERN PACIFIC.—See editorial comment in regard to the Supreme Court's oil lands decision.

RAILWAY CONSTRUCTION IN EGYPT.—It is understood that a start will soon be made in the work of extending the El-Obeid line eastward through Sennar, Gedaref and Kassala to Thamiyam, on the Atbara-Suakin line, thus linking up Abyssinia and Kordofan and placing both these districts in direct contact with the world's markets through the Red Sea. At the same time Tokar, the other great cotton producing center, will be connected with Suakin and Port Sudan by a railway line.

THE RAILWAYS OF KOREA.—The average working mileage of the Korean government railways in 1911 was 709 miles, this being an increase of 53 miles as compared with the previous year. The annual report for 1911 which has just been issued, shows that 2,429,687 passengers were carried during the year, that the passenger mileage reached a total of 104,996,040, and that the passenger receipts were \$2,719,489, these being increases of 20, 13.8 and 15.6 per cent. respectively. The freight traffic on the other hand yielded a revenue of \$5,190,729, an increase of 11.8 per cent. over 1910. There were 1,063,111 tons of freight carried and the total ton mileage was 90,428,325, these being increases of 19.6 and 12.3 per cent. respectively. The total train mileage for the year was 2,307,667, the passenger car mileage 6,675,157, and the freight car mileage 13,295,264. The railways in 1911 owned 133 locomotives, 191 passenger and 1,335 freight cars.

Railway Age Gazette

FIRST HALF OF 1914—No. 26

FIFTY-NINTH YEAR

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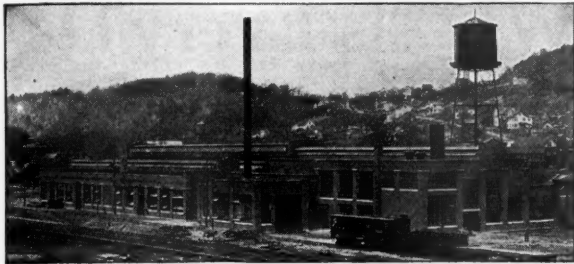
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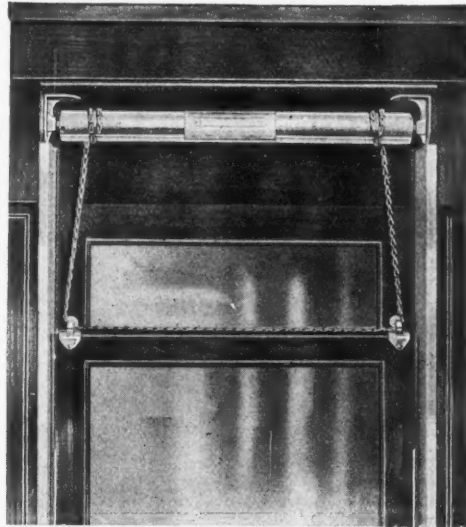
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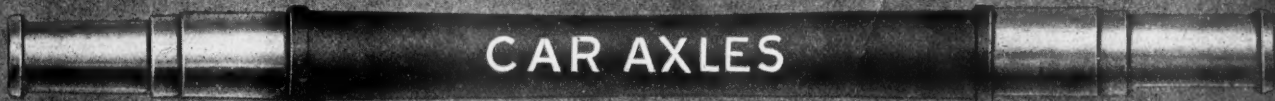
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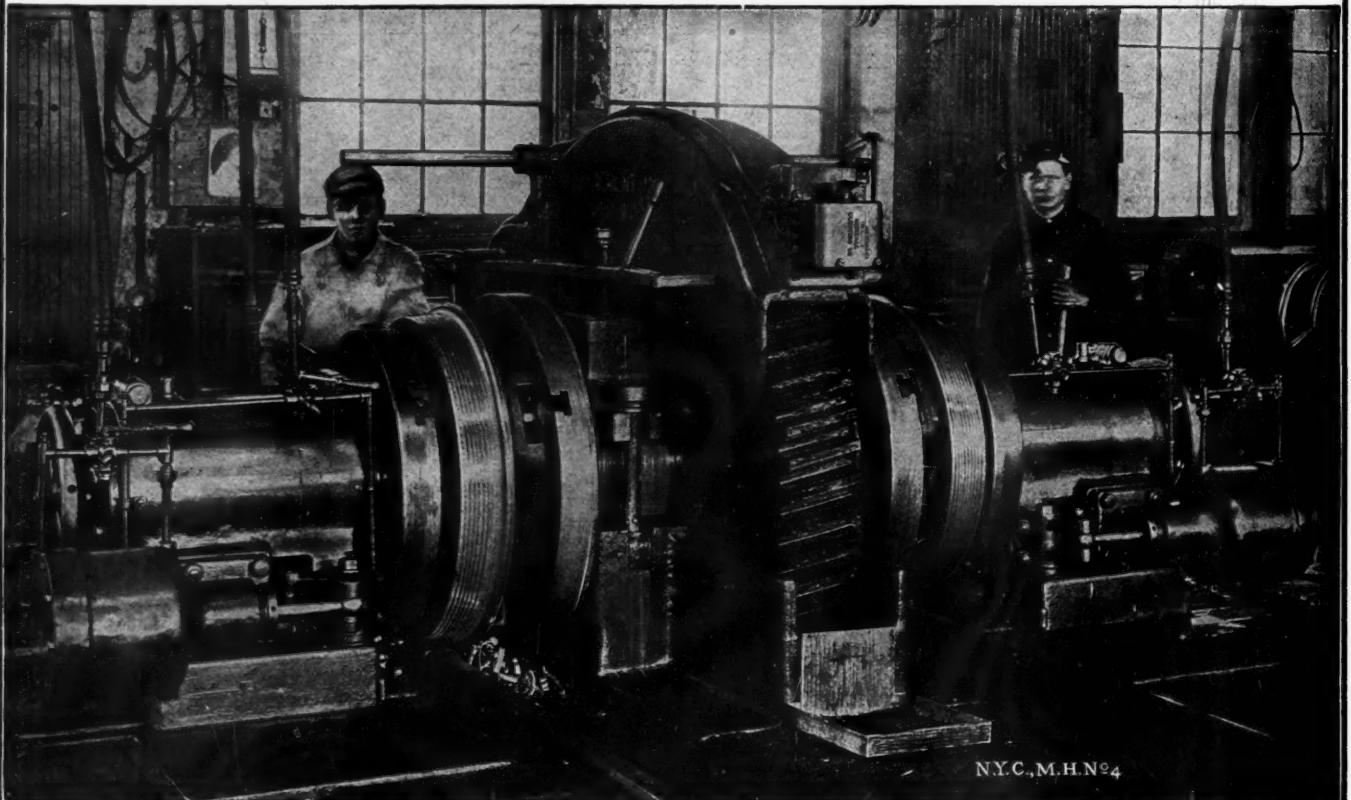
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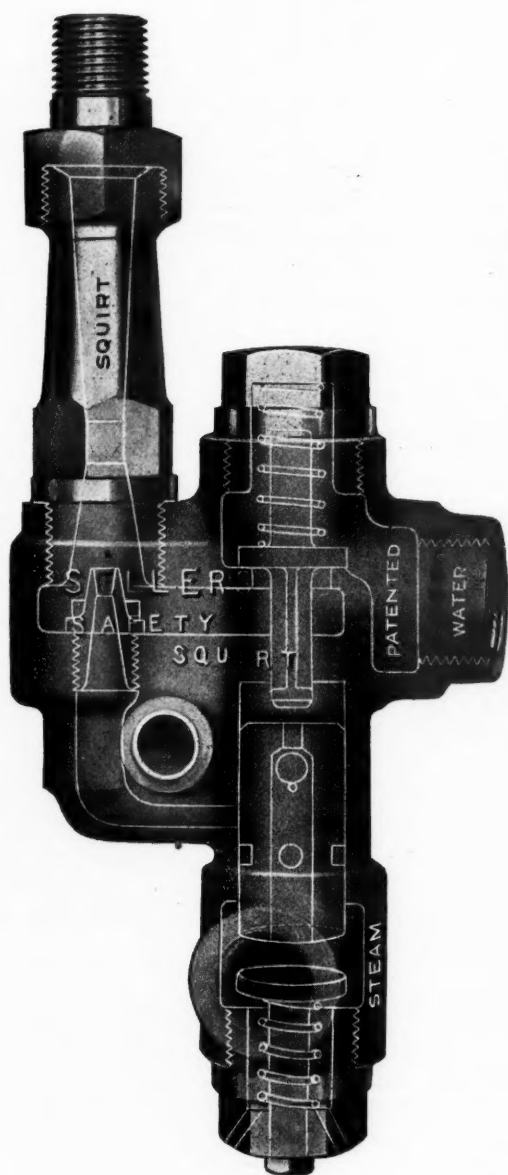
CASTINGS, GUN IRON.
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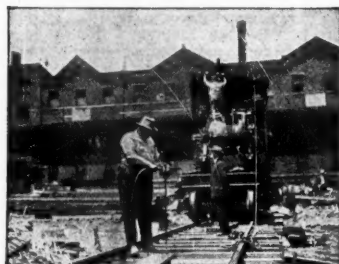
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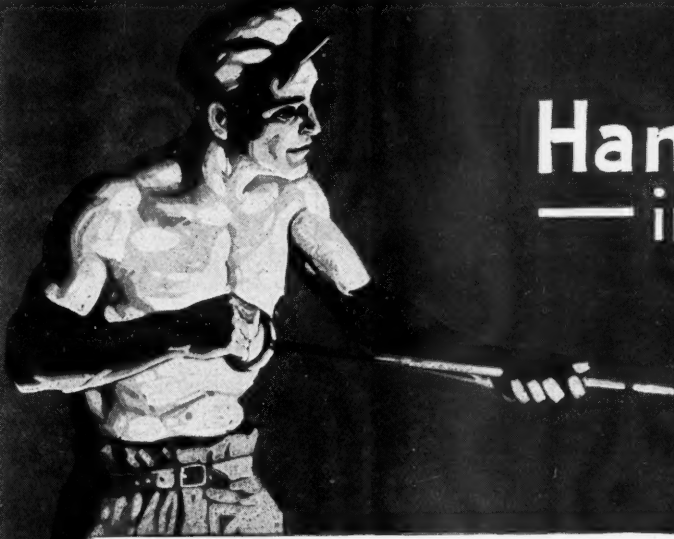
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Railroad Supply Co.
Union Switch & Signal Co.

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Hall Switch & Signal Co.
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SIGNALS, CROSSING.

Cook Railway

Wanted—An Air Brake Story

\$2000.⁰⁰ in prizes for the six best true stories about the value of—

Westinghouse Air Brakes

<i>First Prize Story . . .</i>	<i>\$1,000</i>	<i>Fourth Prize Story . . .</i>	<i>\$150</i>
<i>Second Prize Story . . .</i>	<i>500</i>	<i>Fifth Prize Story . . .</i>	<i>100</i>
<i>Third Prize Story . . .</i>	<i>200</i>	<i>Sixth Prize Story . . .</i>	<i>50</i>

1. The purpose we have in mind is to draw from the experience and practical knowledge of railroad officials and employees, striking stories of Air Brake Performance. We know that the history of the Art of Braking Railroad Trains is rich in dramatic but as yet unwritten narrative. On the one hand is a vast amount of such material as spectacular escape from wreck or disaster; and on the other hand a still larger—and largely unexplored—field covering the concrete evidences that efficient train control is the supreme factor in the ability to handle heavier freight and passenger traffic; and that increased tonnage, longer trains, higher speeds, etc., are simply visible demonstrations of the controlling influence of the Air Brake as expressed in the larger earning power possible from operations.

2. Each "story" must be written either from the practical experiences or personal observations of the writer or from information obtained at first hand from railroad men who actually know the facts.

Each contestant may choose his own individual style of expression, use railroad dialect if desired and illustrations if thought advisable. Correct names, dates, places and persons should be used so far as possible but fictitious substitutes may be employed providing this is so stated in the transmitting letter and the fundamental facts related have actually occurred.

There is no limitation as to the time when the facts given in the story may have occurred, but naturally these facts will be of larger interest if covering recent years and particularly if they apply to present standard forms of Westinghouse Brake Equipment.

The stories will be judged primarily upon the convincing character of the narrative as to the value of the Air Brake; originality; striking or unusual features; accuracy of facts given; relation of the story to present day conditions; concise expression; and brevity.

3. The contest is open to bona fide employees of any railroad, steam or electric, in the United States, operating regular traffic schedules, without limitation of any kind as to age, character of work, education, or other qualification.

4. No "story" shall be more than two thousand words in length. Manuscripts exceeding two thousand words will not be considered in the competition.

Each "story" should be written on one side of the sheet only and preferably typewritten. Neither name, address, nor other means of identification should be shown except in the transmitting letter.

5. No expense is involved in entering this contest but it is understood that all narratives submitted become the property of the Westinghouse Air Brake Company whether securing an award or otherwise.

6. Decision as to merits of the stories submitted will be placed absolutely in the hands of a Committee of Judges composed of three prominent persons not associated in any way with the Westinghouse interests.

7. Each "story" should be addressed to the "Judges of Prize Contest," Room 2121, 165 Broadway, New York, N. Y. When received and serially numbered, the manuscripts, without name or other identification, will be turned over to the Committee of Judges by a disinterested party appointed by and acting for the Committee, and who will retain the transmitting letters after making careful record thereon of the serial number of the manuscript. The Judges will, therefore, pass upon the manuscript submitted without knowing by whom written until after the award is made.

8. All stories to be considered in this competition must be in the hands of the Committee on or before August 1, 1914. Announcement of awards by the Committee of Judges will be made as promptly as possible thereafter.

Westinghouse Air Brake Company
WILMERDING, PA.

DIRECTORY OF ADVERTISERS, CLASSIFIED—ALPHABETICAL INDEX, PAGE 5.

SUSPENSION CABLEWAYS — (SEE CABLEWAYS).

SWITCHES AND SWITCHSTANDS.

American Valve & Meter Co.
Buda Company, The.
Cincinnati Frog & Switch Co.
Cleveland Frog & Crossing Co.
Elliot Frog & Switch Co.
Fairbanks, Morse & Co.
Hall Switch & Signal Co.
Indianapolis Switch & Frog Co.
Kilby Frog & Switch Co.
McMyler Interstate Co.
Orenstein-Arthur Koppel Co.
P. & M. Co., The.
Ramapo Iron Works.
Union Switch & Signal Co.
Weir Frog Co.
Western Electric Co.

SYPHONS (REFRIGERATORS). Union Railway Equipment Co.

TANKS.

American Bridge Co.
Bettendorf Co., The.
Fairbanks, Morse & Co.
Kalamazoo Railway Supply Co.
Krupp (Prosser & Son).
National Tube Co.
Virginia Bridge & Iron Co.

TANKS, CAR.

Keith Car Co.

TANKS, OIL STORAGE.

American Bridge Co.
Bowser & Co., Inc., S. F.

TANKS, PORTABLE, ACETYLENE (FOR WELDING). Commercial Acetylene Ry. Light & Signal Co.

TAPES, MEASURING.

Kolesch & Co.
Lufkin Rule Co.

TAPS AND DIES.

Cleveland Twist Drill Co.
Niles-Bement-Pond Co.

TELEPHONE BOOTHS (CAST-IRON). Paul Dickinson, Inc.

TELEPHONE DESPATCHING SYSTEMS. Automatic Electric Co. Western Electric Co.

TELEPHONES AND EQUIPMENT. Automatic Electric Co. Western Electric Co.

THERMOMETER WELLS. Safety First Mfg. Co.

THERMOSTATS. Railway Utility Co.

TIE PLATES.

Dillworth, Porter & Co., Ltd.
Ellyria Iron & Steel Co.
Hart Steel Co.
Lackawanna Steel Co.
National Malleable Castings Co.
Pittsburgh Forge & Iron Co.
P. & M. Co., The.
Q & C Co.
Railroad Supply Co.

TIE RENEWERS. P. & M. Co., The.

TIES, CREOSOTED. International Creos. & Const. Co. Western Electric Co. Wyckoff Pipe & Creosoting Co., Inc.

TIES, STEEL.

American Bridge Co.
Carnegie Steel Co.
Orenstein-Arthur Koppel Co.
Q & C Co.

TIES, WOOD.

Baxter & Co., G. S.
Duncan Lumber Co.
Stone, Frank B.
Wyckoff Pipe & Creosoting Co., Inc.

TIMBER.

Baxter & Co., G. S.
Duncan Lumber Co.
Stone, Frank B.
Wyckoff Pipe & Creosoting Co., Inc.

TIMBERS, STEEL MINE. Carnegie Steel Co.

TIN ROOFING. American Sheet & Tin Plate Co. Stark Rolling Mill Co.

TIRES, STEEL. Krupp (Prosser & Son). Midvale Steel Co. Railway Steel-Spring Co. Standard Steel Works Co.

TOOL STEEL—(SEE STEEL, TOOL). TOOLS, BOILERMAKERS. Cleveland Twist Drill Co. Niles-Bement-Pond Co.

TOOLS, MACHINISTS. Cleveland Twist Drill Co. Niles-Bement-Pond Co.

TOOLS, PNEUMATIC—(SEE PNEUMATIC TOOLS). TOOLS, PORTABLE — (SEE PORTABLE TOOLS).

TOOLS, TRACK.

Buda Company, The.
Cleveland Twist Drill Co.
Coes Wrench Co.
Fairbanks, Morse & Co.
Kalamazoo Railway Supply Co.
Railroad Supply Co.
Zelnicker Supply Co., Walter A.

TRACING CLOTH — (SEE DRAWING MATERIALS). TRACK DRILLS — (SEE DRILLS, TRACK).

TRACK GAGES AND LEVELS. Buda Company, The.

TRACK JACKS—(SEE JACKS). TRACK, PORTABLE. Orenstein-Arthur Koppel Co.

TRACK SIGNS. Buda Company, The.

TRACK TOOLS — SEE TOOLS, TRACK).

TRACTORS, TURNTABLE. Nichols & Bro., Geo. P. Weir & Craig Mfg. Co. Whiting Foundry Equipment Co.

TRAIN SHEDS. American Bridge Co.

TRANSFER TABLES. American Bridge Co. Brown Hoisting Machinery Co. Industrial Works. McMyler Interstate Co. Nichols & Bro., Geo. P. Northern Engineering Works. Sellers & Co., Inc., Wm. Weir & Craig Mfg. Co. Whiting Foundry Equipment Co.

TRANSMISSION, POWER. Link Belt Co. Sellers & Co., Inc., Wm.

TRAP DOORS — (SEE DOORS, PLATFORM TRAP).

TREAD SAFETY. American Mason Safety Tread Co.

TROLLEYS—(SEE HOISTS, ELECTRIC; HOISTS, HAND AND HORSE POWER).

TRUCK BOLSTERS — (SEE BOLSTERS, STEEL).

TRUCK FRAMES—SEE FRAMES, TRUCK).

TRUCKS, CAR AND LOCOMOTIVE. American Steel Foundries. Bettendorf Co., The. Central Locomotive & Car Works. Commonwealth Steel Co. Johnson & Co., J. R. McConway & Torley Co. Pressed Steel Car Co. Standard Car Truck Co. U. S. Metal & Mfg. Co.

TRUCKS, FREIGHT ELECTRIC. Sprague Electric Works of General Electric Co.

TRUCKS, WAREHOUSE AND EXPRESS. Boston & Lockport Block Co.

TUBE CUTTERS. Faessler Mfg. Co., J.

TUBE EXPANDERS. Faessler Mfg. Co., J. Krupp (Prosser & Son). Niles-Bement-Pond Co.

TUBES, BOILER. Krupp (Prosser & Son). National Tube Co. Parkesburg Iron Co. Tyler Tube & Pipe Co.

TUBES, STAY. Falls Hollow Staybolt Co.

TURBINES, STEAM. Sturtevant Co., B. F.

TURNBUCKLES. American Bridge Co.

TURNABLES. American Bridge Co. Central Locomotive & Car Works. Fairbanks, Morse & Co. Industrial Works. Link Belt Co. McMyler Interstate Co. Missouri Valley Bridge & Iron Co. Nichols & Bro., George P. Northern Engineering Works. Orenstein-Arthur Koppel Co. Phoenix Bridge Co. Sellers & Co., Inc., Wm. Virginia Bridge & Iron Co. Weir & Craig Mfg. Co. Whiting Foundry Equipment Co.

TURNABLE TRACTORS — (SEE TRACTORS, TURNABLE).

TURRET LATHES—(SEE LATHES, TURRET).

TWIST DRILLS — (SEE DRILLS, TWIST).

UNDERFRAMES, STEEL. Bettendorf Co., The. Chicago Steel Car Co. Greenville Steel Car Co. Pressed Steel Car Co. Ralston Steel Car Co.

UNIONS. Dart Mfg. Co., E. M. Jefferson Union Co. National Tube Co.

UNLOADING PLOWS. Bucyrus Co.

UPHOLSTERY, CAR. Chase & Co., L. C. Pantasote Co.

VACUUM CLEANERS. Railway Utility Co.

VALVE GEAR. Mudge & Company.

VALVES, BALANCED, MAIN SLIDE. American Balance Valve Co. Ironton Engine Co.

VALVES, GATE. American Valve & Meter Co. Edwards Co., Inc., O. M. Hunt-Spiller Mfg. Corporation. National Tube Co. Wood & Co., R. D.

VALVES, PISTON. American Balance Valve Co.

VALVES, POP, SAFETY, THROTTLE AND BLOW-OFF. Ashton Valve Co. Crosby Steam Gage & Valve Co. Detroit Lubricator Co. Manning, Maxwell & Moore, Inc. Nathan Mfg. Co. National Tube Co.

VALVES, TANK. Edwards Co., Inc., O. M. Union Railway Equip. Co.

VANADIUM — (SEE CASTINGS, FORGINGS, SPRINGS, ETC.).

VARNISHES. Berry Brothers, Inc. Devos & Co., F. W. Kay & Ess Co. Sherwin-Williams Co. Standard Asphalt & Rubber Co. Tousey Varnish Co.

VARNISH GUMS. Standard Asphalt & Rubber Co.

VELOCIPEDE CARS — (SEE CARS, HAND).

VENTILATORS, CAR. Mudge & Company. Railway Utility Co. Ross-Wortham Co. Safety First Mfg. Co. Standard Heat & Ventilation Co., Inc. Sturtevant Co., B. F.

VENTILATORS, SHOP AND ROUNDHOUSE. Dickinson, Inc., Paul. Drouvé Co., G. The. Lupton's Sons Co., David.

VESTIBULE CURTAIN CATCHES—(SEE CURTAIN CATCHES, VESTIBULE).

VESTIBULE DIAPHRAGMS — (SEE DIAPHRAGMS, VESTIBULE).

VESTIBULE TRAP DOORS — (SEE DOORS, PLATFORM TRAP).

VESTIBULES, CAR. Gould Coupler Co. McConway & Torley Co. Toledo Pipe Threading Machine Co.

WASHERS. National Malleable Castings Co.

WASHERS, BOILER. Nathan Mfg. Co. Sellers & Co., Inc., Wm.

WASTE, COTTON. Lillie, Dexter P.

WATER CLOSETS, CAR — (SEE CLOSETS, WATER).

WATER COLUMNS. American Valve & Meter Co. Fairbanks, Morse & Co. Franklin Railway Supply Co. Kalamazoo Railway Supply Co. National Tube Co. Ogle Construction Co. Western Railway Equipment Co.

WATER FILTERS—(SEE FILTERS, WATER).

WATER GAGES — (SEE GAGES, WATER).

WATER HEATING SYSTEMS. Warner-Reiss Sales Co.

WATERPROOFING. Barrett Mfg. Co. Cabot, Inc., Samuel. Johns-Manville Co., H. W. Lehon Company. Standard Asphalt & Rubber Co. Union Fibre Co.

WATER PURIFIERS. American Water Softener Co. Dearborn Chemical Co. Reisert Automatic Water Purifying Co.

WATER SOFTENER PLANTS. American Water Softener Co. Buda Company, The. Dearborn Chemical Co. Reisert Automatic Water Purifying Co.

WEATHER STRIPS. Acme Supply Co. Edwards Co., Inc., O. M.

WEED BURNERS. Commonwealth Steel Co. Mudge & Company.

WEED AND GRASS KILLER. Atlas Preservative Co. of America.

WELDING AND CUTTING APPARATUS. Prest-O-Lite Co.

WHEEL CENTERS, DRIVING. American Steel Foundries. Commonwealth Steel Co. Hunt-Spiller Mfg. Corporation. Krupp (Prosser & Son). Scullin-Gallagher Iron & Steel Co. Standard Steel Works Co.

WHEEL PRESSES, HYDRAULIC. Chambersburg Engineering Co. Niles-Bement-Pond Co. Sellers & Co., Inc., Wm. Watson-Stillman Co. Wood & Co., R. D.

WHEELS, CAR AND LOCOMOTIVE. American Steel Foundries. Association of Manufacturers of Chilled Car Wheels. Carnegie Steel Co. Griffin Wheel Co. Krupp (Prosser & Son). Lima Locomotive Corporation. Link Belt Co. Midvale Steel Co. Orenstein-Arthur Koppel Co. Pressed Steel Car Co. Railway Steel-Spring Co. Standard Steel Works Co.

WHISTLES. Ashton Valve Co. Crosby Steam Gage & Valve Co. General Electric Co. Western Electric Co.

WINDOW FIXTURES, CAR — (SEE FIXTURES, WINDOW).

WINDOW SCREENS, CAR — (SEE SCREENS).

WIRE. American Steel & Wire Co. General Electric Co. Kerite Insulated Wire & Cable Co. Okonite Company. Western Electric Co.

WIRE, INSULATED. American Steel & Wire Co. Automatic Electric Co. General Electric Co. Kerite Insulated Wire & Cable Co. Okonite Company. Western Electric Co.

WIRE ROPE. American Hoist & Derrick Co. American Steel & Wire Co.

WIRE ROPE TRAMWAYS — (SEE CABLEWAYS).

WIRE, VANADIUM. American Vanadium Co.

WOOD PRESERVATIVES. Atlas Preservative Co. of America. Cabot, Inc., Samuel. International Creos. & Const. Co. Wyckoff Pipe and Creos. Co., Inc.

WRECKING CARS — (SEE CARS, WRECKING).

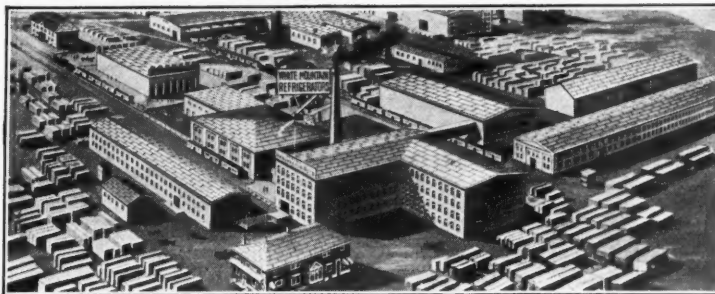
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Not a Cent for Paint or Repairs In Twenty Years

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A remarkable record. But not exceptional for J-M Asbestos Roofing. This roofing has given similar service for fifteen to thirty years on hundreds of railroad shops, terminals and buildings of all types.



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absolutely water-tight. And as they eliminate the smearing over of seams with black cement, they give the roof an unbroken, handsome white surface.

Furnished in ready-to-lay and built-up form. Sold direct if your dealer can't supply you.

J-M Regal Roofing was perfected to supply a demand for a rubber type, wool felt roofing, lower in price than J-M Asbestos, but containing the H. W. Johns-Manville Co.'s standard of quality and service. Also supplied with J-M Cleats.

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Putnam Latest Pattern 42" Coach Wheel Lathe



All Steel Gearing.
Heaviest and strongest built.
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Ready Roofings for
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Railway Motor Cars and Locomotives

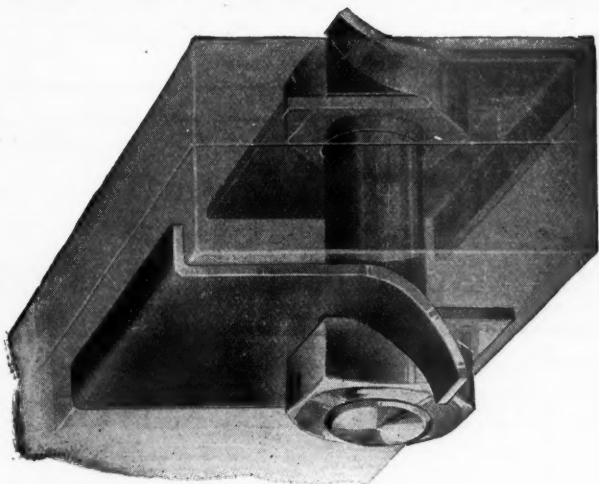
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Nut and Bolt Fastener



Shows effective locking of both Bolt and Nut.
Note locking arm outside Bolt Head and Nut.
Easy to apply and get at.

Simple

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The Car Seal That Cannot Be Manipulated

Stop All That Tampering!

and manipulation of car seals
on your railroad by pilferers
and at the same time stop the
losses and claims resulting
therefrom, by using the

"EDGAR" CAR SEAL

Can be applied to any car fastener, without the use of a sealing iron. "Rides" to destination intact, **unless** tampered with—then it breaks into several pieces, so that it cannot be "repaired" to pass seal inspection. That is the all-important advantage of the Edgar seal—and in this it is distinctive and different from any other car seal now in use.

When you buy others you get just seals. When you buy "Edgar" seals you get seal service—and they cost no more.

Send for a sample and test it out.

(See Railway Age Gazette of January 16, 1914, page 133.)

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THE BARBER TRUCK

Gives Bolster Lateral Travel

Our steel roller bearing center plate gives the truck free radial travel, lessening train resistance and preventing derailment.

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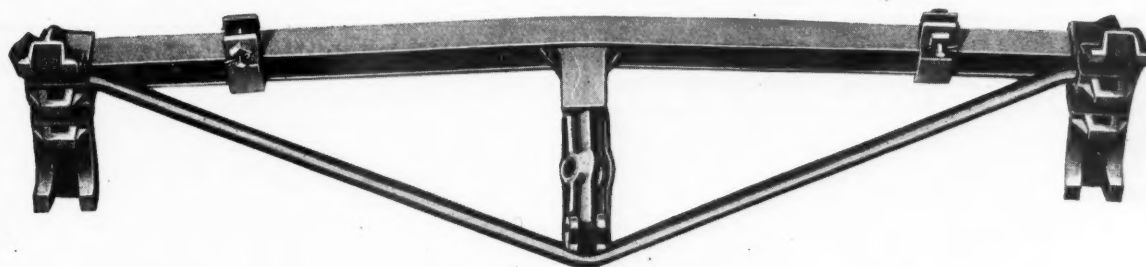
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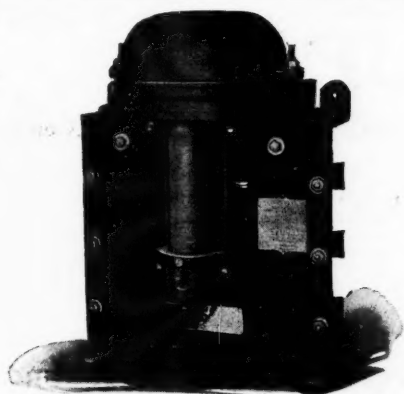
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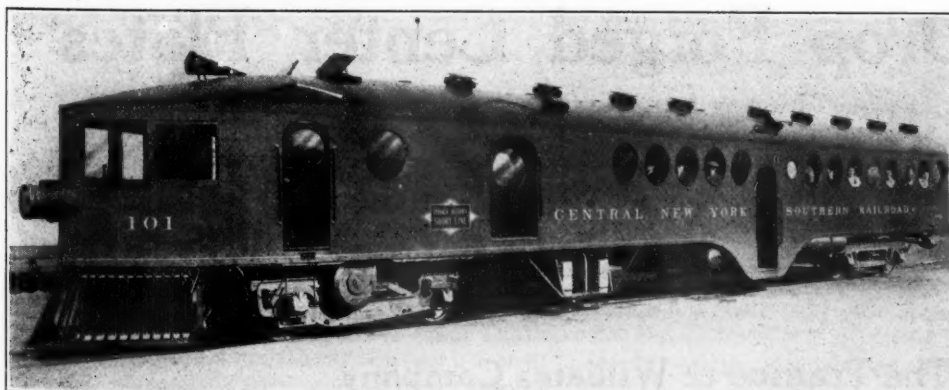
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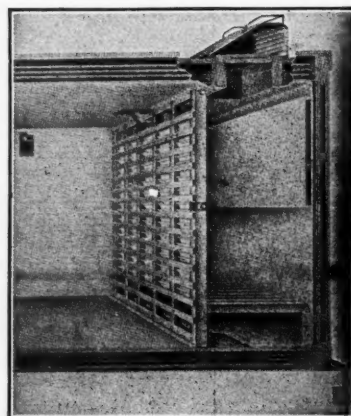
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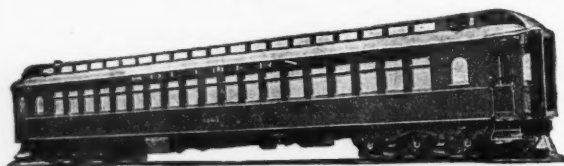
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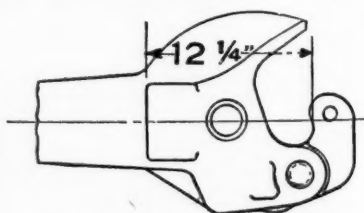
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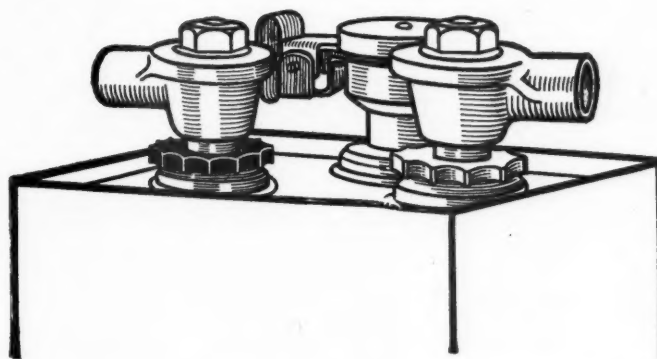
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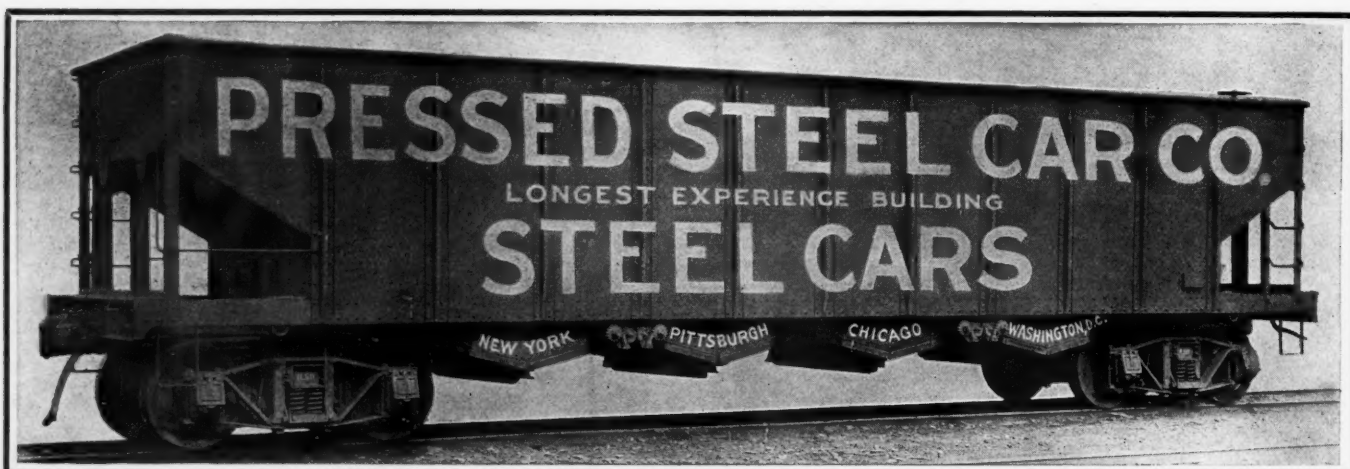
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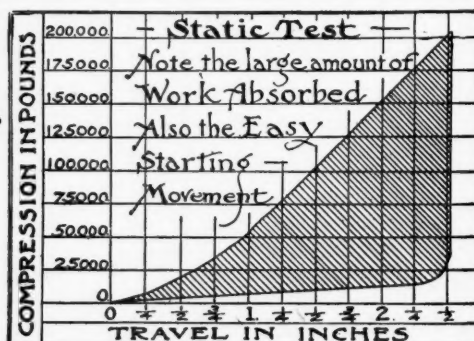
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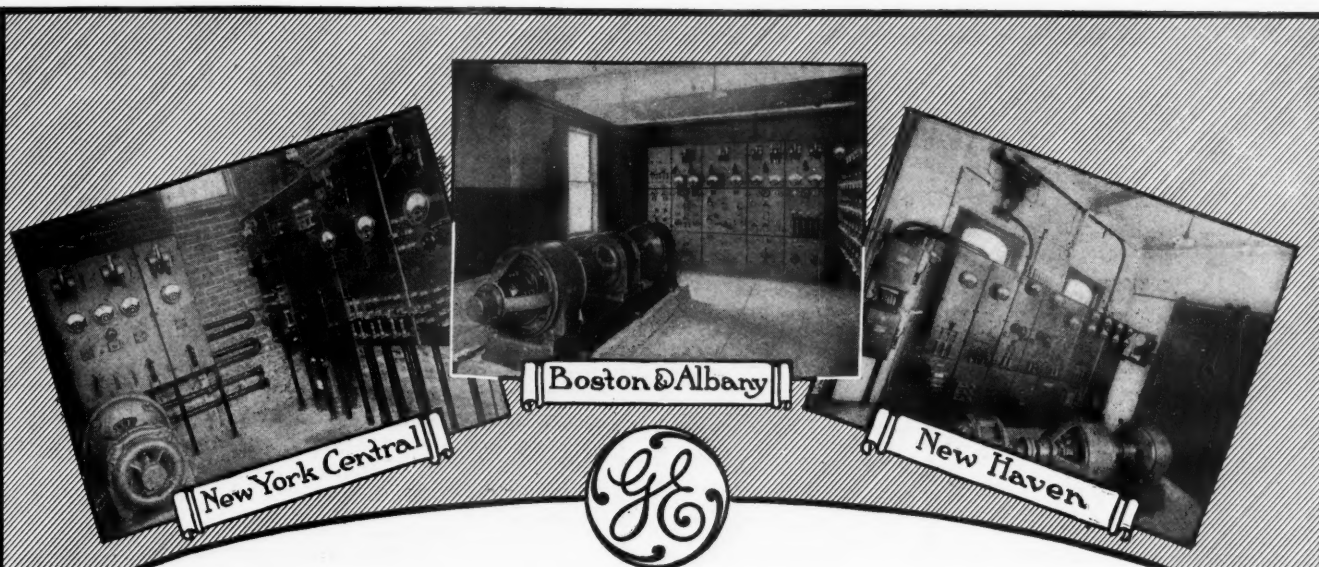
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EDITORIAL ANNOUNCEMENT

The Operation of Large Classification Yards

The prize winning papers on the operation of large classification yards were selected from 22 papers received. The contributors were, with a few exceptions, superintendents, trainmasters or yardmasters—men directly on the firing line.

These papers form the most complete discussion of this vital and important subject which has ever been published. More important, however, is the fact that this discussion has been prepared by men who are contending daily with the problem which they describe.

These men describe the methods which they are using to reduce detention of cars in yards, to secure their prompt and accurate classification, and to handle bad order cars expeditiously.

Expeditious handling of cars through yards is analogous to, and only less important than, increased train load in the economical operation of a railroad. Unlike increased train load, the successful solution of the problem is dependent more upon individual ingenuity and less upon the facilities provided in the way of locomotives.

The two prize winning papers will be published in the issue of next week.

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EDITORIAL ANNOUNCEMENTS

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There's little to add to this:

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Review in the
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May 30, 1914

Previous editions of this pocket hand-book, beginning with the first one in 1899, have demonstrated that it is well suited to the needs of the student, as well as of the practising engineer in field and office. By revising and extending the chapters on turnouts, connecting tracks and crossings, and spirals, the author has filled a need which has been quite generally felt by the profession for several years. These, with other revisions, have perfected the entire text and tables to a degree that is certain to win general approval. Prominent attention should be given here to the excellence of typography, binding, and the other details of manufacture which characterize the book and which are so particularly appropriate and important in a work of this kind.

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Reversed Curves
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 Turnouts
 Connecting Tracks and Crossings
 Spiral Easement Curve

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 Methods of Computing Earthwork
 Special Problems in Earthwork
 Earthwork Tables
 Earthwork Diagrams

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Radii and Their Logarithms
 Tangent Offsets and Middle Ordinates
 Tangent Distances for 1° Curve
 Corrections for Tangent Distances
 External Distances for a 1° Curve
 Spirals for Various Degrees of Curve
 Deflection Angles to Chord Points of Spirals
 Deflection Angles from Intermediate Points on Spirals
 Coefficient of x_c , y_c , p , q
 Diagram for Lengths of Spirals

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 Acres for Strip 100 Feet Wide
 Curves for Metric System
 Barometric Heights
 Logarithms of Numbers
 Logarithmic Sin, Cos, Tan and Cotan
 Logarithmic Sin and Tan of Small Angles
 Logarithmic Verse and Exsec
 Logarithmic Verse and Exsec of Small Angles
 Natural Sines and Cosines
 Natural Tangents and Cotangents

Natural Versed Sines and External Secants
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 Radius = 1
 Differences between Circular Arcs and Chords
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Operation of boarding trains and camps our specialty. Laborers furnished for all classes of work. Write us for facts and figures.

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AND
CARBON TOOL STEELS**

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KEEP YOUR NAME BEFORE
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Unconditionally guaranteed to give 50 per cent.
greater mileage and not to heat to cut the axle or pin
DAMASCUS NICKEL BRONZE
THE UNEXCELLED RAILROAD ALLOY
Quotations and complete information on request

The MODERN WAY of
handling ASHES is by the
PNEUMATIC SYSTEM

Write and let us tell you all about it.

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Steger Bldg., Chicago, Ill.
Catalogue 8—GECO Pneumatic Ash
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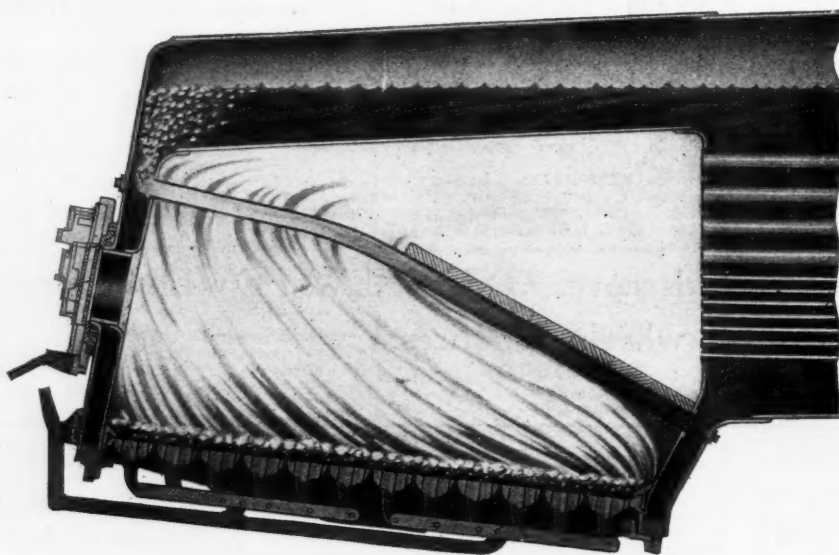
VANADIUM LOCOMOTIVE PARTS

APPLIED FROM JANUARY, 1913, TO MAY 15th, 1914

These records cover ONLY NEW POWER, except in the case of wheels and tires.

Name of Part	Number of Engines Equipped	Number of Parts Applied
Driving Axles	476	1297
Main Rods	377	822
Side Rods	384	1986
Frames	993	2054
Crank Pins	198	612
Piston Rods	69	138
Springs (engine and tender).....	366	—
Engine Truck Axles	62	62
Wheels	—	700
Tires	—	1150
Cylinders (vanadium cast iron)....	260	540

AMERICAN VANADIUM COMPANY
322 Vanadium Building, Pittsburgh



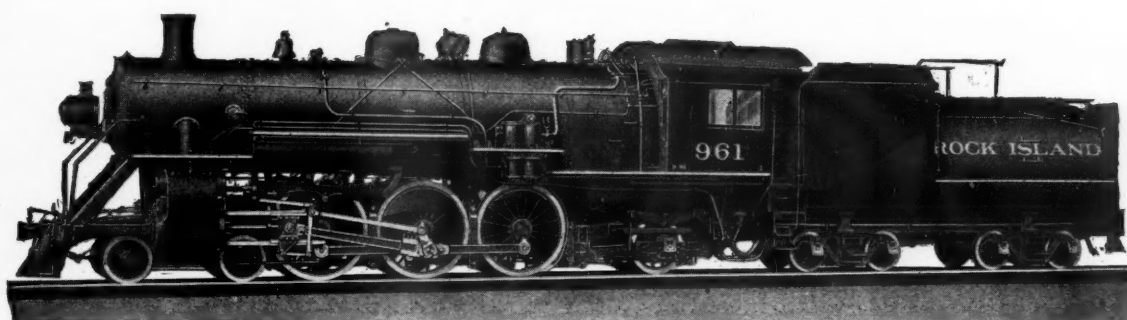
Official Success To You

Superheaters superheat most with
The hottest flame you can give.
A superheated firebox means more superheat.
More superheat means more power.
More power means official success to you, personally.
The Security Sectional Arch
Means all this and does all this.

AMERICAN ARCH COMPANY

30 CHURCH STREET, NEW YORK
McCORMICK BUILDING, CHICAGO

INCREASED CAPACITY WITHOUT INCREASED OPERATING COSTS



PACIFIC TYPE PASSENGER LOCOMOTIVE—ROCK ISLAND LINES

Total Weight of Engine, 281,500 pounds; Weight on Drivers, 174,500 pounds; Diameter of Drivers, 73 inches; Boiler Pressure, 190 pounds; Cylinders, 25½x28 inches; Maximum Tractive Power, 40,250 pounds.

ACTUAL TEST TRAINS VS. CARDED TIME ON THE MISSOURI DIVISION OF THE ROCK ISLAND LINES

	Davenport to Eldon Distance 111.6 Miles		Eldon to Trenton Distance 121.5 Miles	
	Carded Time Train No. 1	Actual Test Test No. 16	Carded Time Train No. 1	Actual Test Test No. 17
Actual running time, hours and minutes	2:40	2:40	3:08	3:19
Number of stops	4	6	3	3
Average schedule speed, M. P. H.	38.2	38.5	36.5	34.2
Average running speed,	41.8	41.8	38.8	36.4
Number of cars.	6	14	6	14
Average weight of car, tons	65.0	66.6	65.0	66.6
Train tonnage—Exclusive of lading	390	933	390	933

AMERICAN LOCOMOTIVE COMPANY
30 CHURCH STREET, NEW YORK

The Dominant Locomotive Stoker

VI

Horace Greeley said "The way to resume is to resume," we don't know how many hundreds or thousands of times. He was not afraid to repeat. Neither are we. For instance, let us repeat our statement of last week, that it is not necessary to remove our device or any part of it for the monthly inspection of stay-bolts required by the Government.

One of the numerous points of superiority of the STANDARD STOKER—another respect in which it dominates its field.

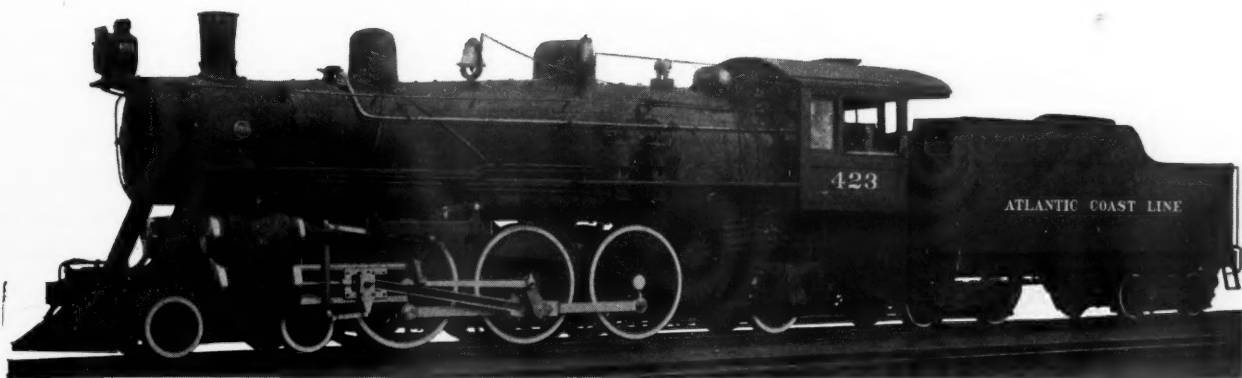
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du Pont Building
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Grand Central Terminal
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ECONOMICAL MOTIVE POWER

Maintenance cost is reduced by using as few types of locomotives as are necessary for economically handling the traffic, and by fitting them, where practicable, with interchangeable details. Some types of locomotives are more suitable for various kinds of service, than others. The Pacific is an example of an all-around type, which, under favorable conditions, can be used in general road work, either freight or passenger.



Pacific Type Locomotive for the Atlantic Coast Line.
R. E. Smith, General Supt. Motive Power.

CYLINDERS—22 x 28 inches.
DRIVING-WHEELS, DIAM.—68 inches.
STEAM PRESSURE—200 lbs.
GRATE AREA—54.2 sq. ft.

WATER HEATING SURFACE—2,635 sq. ft.
SUPERHEATING SURFACE—524 sq. ft.
WEIGHT ON DRIVING-WHEELS—140,400 lbs.
WEIGHT, TOTAL ENGINE—226,500 lbs.

TRACTIVE FORCE—33,900 lbs.

The locomotive illustrated above is equipped with a superheater, brick-arch and combustion chamber. It can be safely used on rails weighing 80 pounds and over per yard, and with driving-wheels 68 inches in diameter is suitable for either heavy passenger or fast freight service.

THE BALDWIN LOCOMOTIVE WORKS PHILADELPHIA, PA., U. S. A.

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Krupp Steel Locomotive Tires and Car Wheel Tires. Steel Tired Car Wheels. Crank Shafts. Steel Forgings and Castings. Krupp Bar Steel.

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THOMAS PROSSER & SON, 22 Platt Street, New York

Krupp Automobile Steel Forgings and Frame Members, Ball Mills, Tube Mills and other Machinery. Prosser Boiler Tube Expanders

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Economical to Install and Maintain—No Working Parts—
Small Tank Supplies 300 Burning Hours—Penetrating—Not Blinding.

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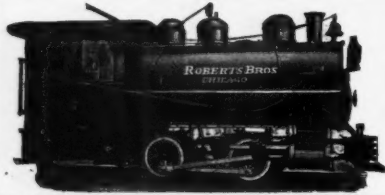
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Valves for Superheat
Jersey Shore, Pa. Valves for 1000 lbs. pressure

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Contractors' Locomotives
Built on honor and guaranteed in every particular.
Davenport Locomotive Works
Davenport, Iowa



The American Valve & Meter Co.
Manufacturers of Poage Water Columns
Switchstands and Switch Safety Appliances
CINCINNATI, OHIO

Watch for interesting advertisement, issue of July 17, 1914.
Valuable data on Poage Water Columns is given on page 55 of the June 19 issue.



Consolidation Locomotive, San Antonio & Aransas Pass Ry.

LIMA LOCOMOTIVES

Upon dependable motive power depends the success of modern rail-roading. Our manufacturing facilities, with modern machinery, improved methods and a large output, enables us to deliver engines that make good.

Service records substantiate our claims. Write for Locomotive Bulletin No. 1.

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SAFETY FIRST



Our Locomotive Brake Shoes are Practically Indestructible, except by Wear.

No loose parts to break away.

Hook is integral with the Steel Back.

Made only by

AMERICAN BRAKE SHOE & FOUNDRY CO.

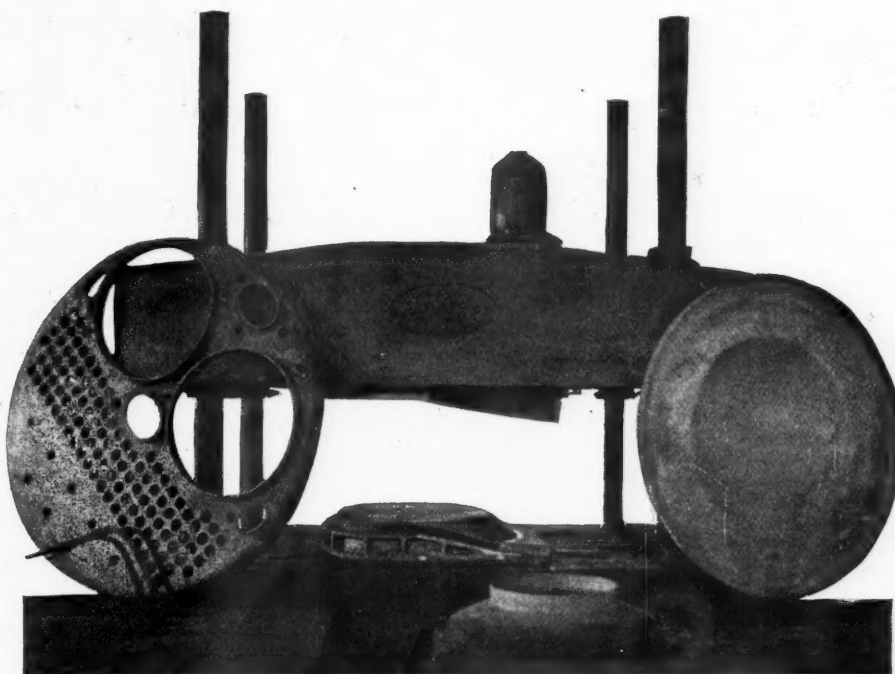
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Powerful 1,000 tons Hydraulic Press used by the Lukens Iron & Steel Company.

Proof of Future Efficiency

Correct mill practice, proper machines and expert supervision in the production of **Lukens Locomotive Firebox Steel** is practically an assurance of future efficiency.

However, the **Lukens Iron & Steel Company** are ever striving for the best in all things pertaining to the production of locomotive firebox steel; powerful and efficient machinery is procured to back the assertion that **LUKENS SIGNIFIES QUALITY**.

The specially constructed straightening rolls, the powerful hydraulic press and flange spinners, are striking examples of that keen foresight and careful selection of equipment that guarantee future efficiency to **Lukens Locomotive Firebox Steel**.

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TATE RADIAL & ADJUSTABLE CROWN STAYS

FOR LOCOMOTIVE FIREBOXES.
USED INSTEAD OF SLING STAYS BACK OF FLUE SHEET FOR CROWN AND RADIAL STAYS.

K" BOLT ASSEMBLAGE RIVETED END "LK" OR "KK" SLEEVES

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ROUND NUT ASSEMBLAGE "LK" OR "KK" SLEEVES

BUTTON HEAD STAY

WE DO NOT SUPPLY BOLTS OF THE BUTTON HEAD TYPE

Flannery Bolt Company
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In Locomotive Operation the Use of Dearborn Treatment

reduces the consumption of fuel and oil, increases the life of flues and fire-box sheets, enables engines to run longer periods between boiler washings, reduces engine failures, and generally improves operating conditions.

Dearborn Water Treating Preparations are compounded to meet requirements shown by analyses of the waters used.

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McCormick Building, Chicago

The "Monitor" Lifting Locomotive Injector



Stands in the front rank of locomotive boiler feeders. It is a self-contained instrument of the simplest possible construction. The body is made in two parts, bolted together; either part replaced without throwing away the whole. Cost of maintenance thus greatly reduced.

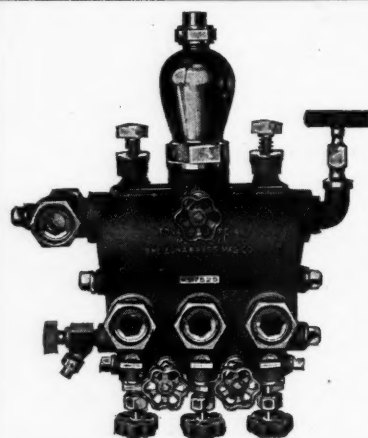
The "Monitor" works steadily with fast or slow, heavy or light, trains. Feeds water of a high temperature, has a wide range of capacities, and is absolutely reliable.

Injectors, Lubricators and Locomotive Appliances
Descriptive Catalogue on Request



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SOLE AGENCY OF THE COALE MUFFLER SAFETY VALVES

5



TO SAVE OIL Get Wise To Efficient Means

The Edna Locomotive Bull's Eye Lubricators fill the bill and deliver the goods under all conditions.

All sizes from one to eight feed.

Complete Line of Injectors, Reflex Water Gauges, etc. Catalogue and prices on application.

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2

HOLLOW THREADED STAYS



Fully comply with Federal Inspection Law, save the cost of drilling and breakage of drills. The hole is rolled absolutely in the center. They inspect automatically at both ends, and the air admitted into the firebox through Hollow Stays greatly improves combustion.

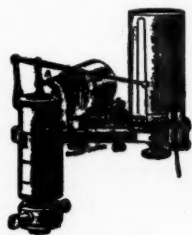
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FALLS HOLLOW STAYBOLT COMPANY
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2

Crosby Steam Engine Indicator STANDS UNRIVALED



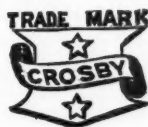
With Sargent's Electrical Attachment any number of diagrams can be taken simultaneously.

This Attachment is protected by Letter Patent to Frederick Sargent, M. E. The public is warned against other similar attachments which are infringements.

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Crosby Pressure Gage Tester Is a Necessity in Railroad Shops

Simple and accurate,
and preferable to
Mercury Column
in every point

Constructed on scientific principles and guaranteed accurate

Office and Works:
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MICA Lantern Globes

Storrs Mica Co., R. R. Dept., Owego, N. Y.

2

Some Facts About "NATIONAL" Pipe



which are of interest and value to all users of pipe were published in a two-page announcement (pages 18-19) in the June 19th issue of *Railway Age Gazette*. Turn to it now if you have not read it.

NATIONAL TUBE COMPANY, - Pittsburgh, Pa.

THIS SHOE TURNS YOUR TIRE



While Your Locomotive
Is in Service

WHEEL TRUING BRAKE SHOE CO.

DETROIT, MICHIGAN

Patented—
May 31, 1898; Sept. 1, 1903; Aug. 2, 1904; Dec. 29, 1908; June 15, 1909.

FOSTER

Locomotive Superheater

Power Specialty Co. 111 Broadway, New York

HUNT-SPILLER IRON

HAS THE
STRENGTH and WEARING QUALITIES
that are absolutely necessary in

LOCOMOTIVE CASTINGS

ELIMINATES ENGINE HOUSE REPAIRS

Manufactured by

Hunt-Spiller Mfg. Corporation

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THE BEST
ON
EVERY TRIAL

Request at once Bulletin No.
52135 and further particulars



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LOHMANNIZED SHEETS A SPECIALTY

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OSCILLATING Roller Center Bearing-Flat Sided Rollers permit $2\frac{1}{2}$ times the carrying capacity of any other plate of equal dimensions.

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A. C. Johnson, Passenger Traffic Manager, Chicago, Ill.

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The "SAFETY FIRST" Brake

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NATIONAL GEARED HAND BRAKE

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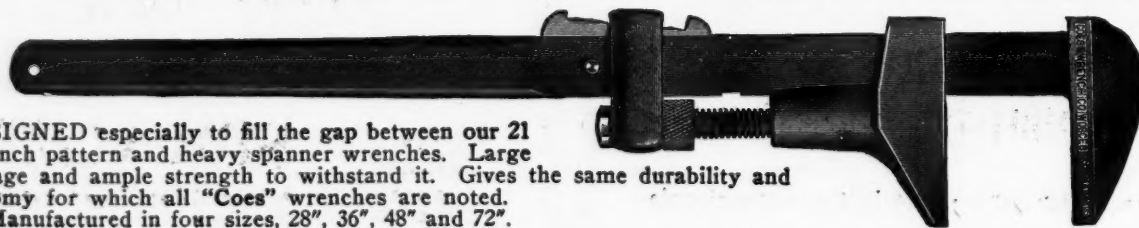
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Quality Products Service
Standard for One Hundred Years
Burden Iron Rivets (B)
Burden Staybolt Iron
Manufactured by
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DESIGNED especially to fill the gap between our 21 inch pattern and heavy spanner wrenches. Large leverage and ample strength to withstand it. Gives the same durability and economy for which all "Coes" wrenches are noted.
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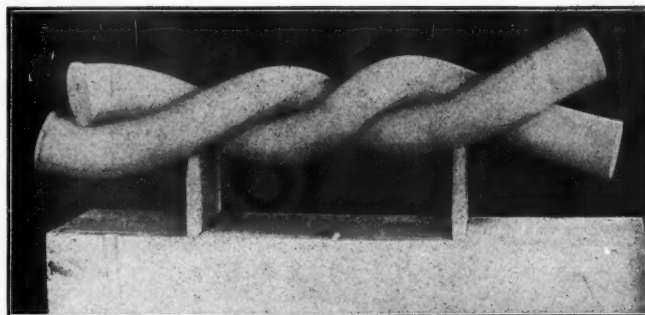
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STANDARDS



COFFIN
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THESE AXLES WERE TWISTED COLD

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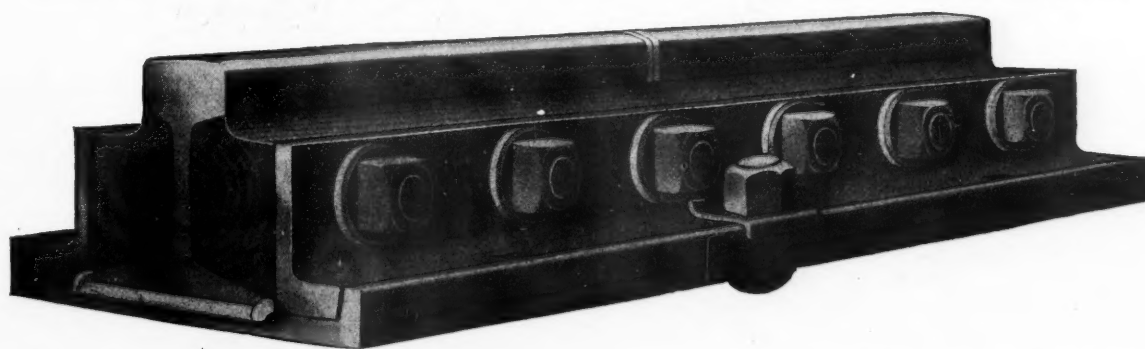
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It can be furnished in any length for any section of rail.

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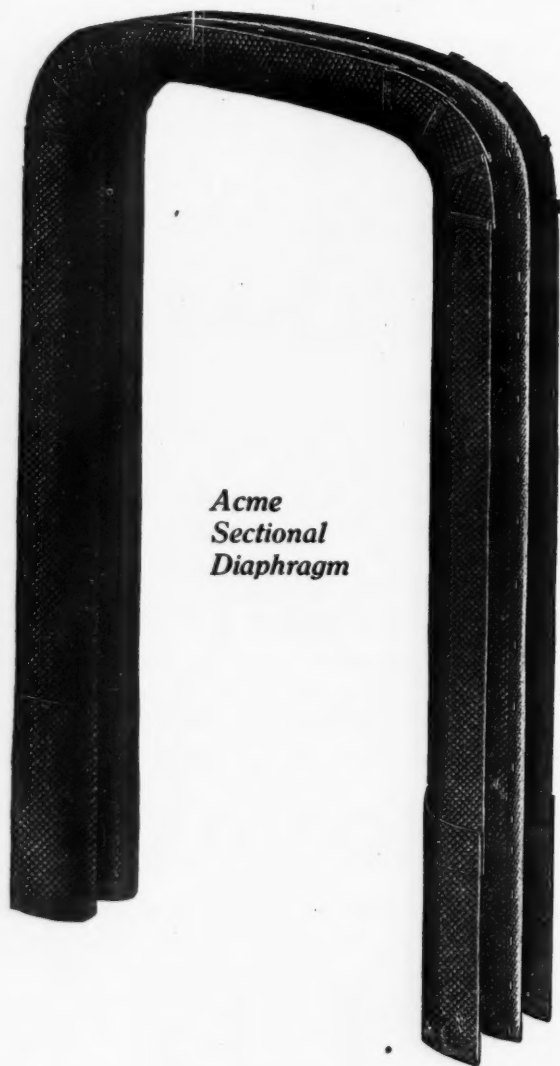
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Seattle

EXPORT REPRESENTATIVES

UNITED STATES STEEL PRODUCTS COMPANY, New York, N. Y.

40-3

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*Acme
Sectional
Diaphragm*

The Acme Sectional Diaphragm is put together with steel and Web binding and staples in order to support the arch and prevent sagging.

The supplemental hood is entirely eliminated with this diaphragm.

The absence of sharp valleys to collect dirt, cinders, and moisture means prolonged life.

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For Every Phase of Railroad Service

Standard Mazda Lamps in sizes from 10 to 500 watts for lighting offices, ticket booths, stations, etc.

Large Mazda Lamps of the improved type, in sizes from 400 to 1000 watts for lighting large areas in stations, shops, yards and concourses.

Train Lighting Mazda Lamps in sizes from 10 to 50 watts for lighting railroad cars.

Westinghouse Mazda Lamps

have always represented the best in incandescent lamps and their record in railroad service is unsurpassed.

It pays to buy equipment that is labelled "Westinghouse"—it is Guaranteed by the Name.

Westinghouse Lamp Company

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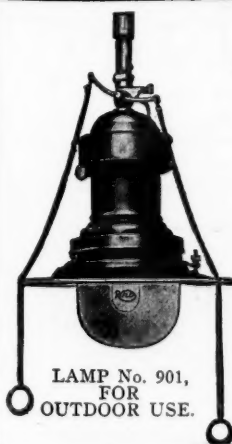


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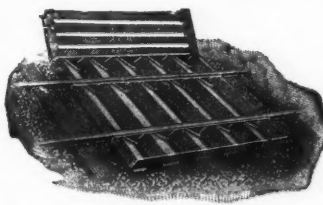
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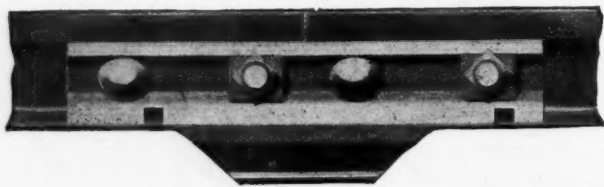
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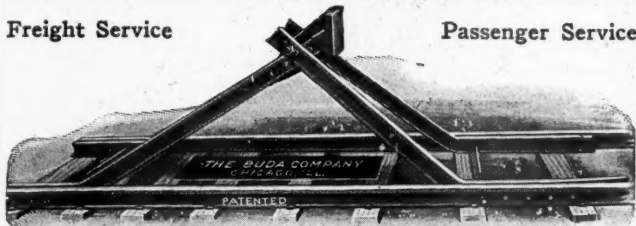
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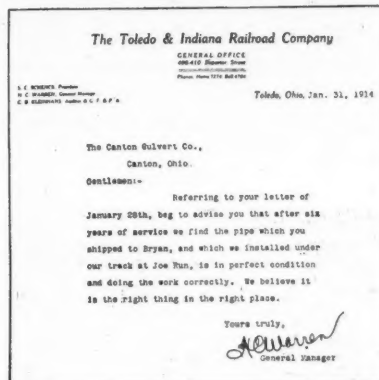
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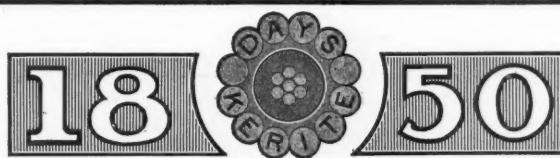
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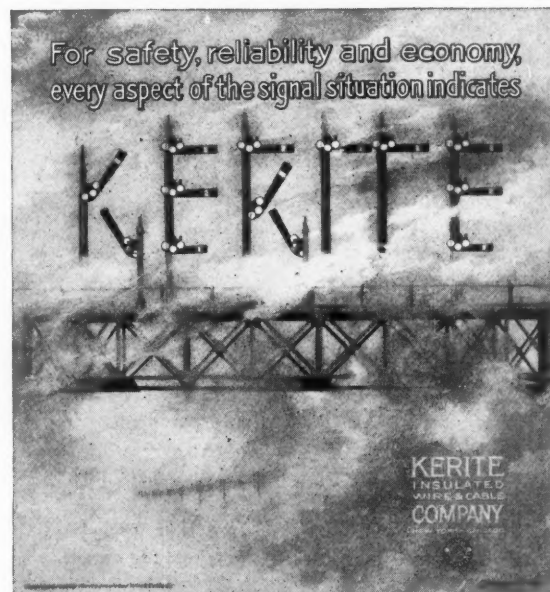


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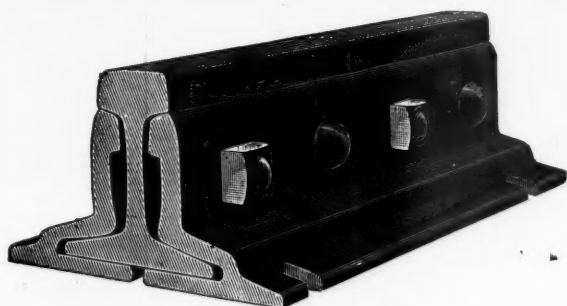
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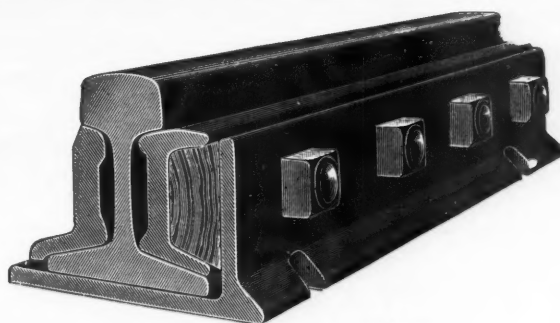
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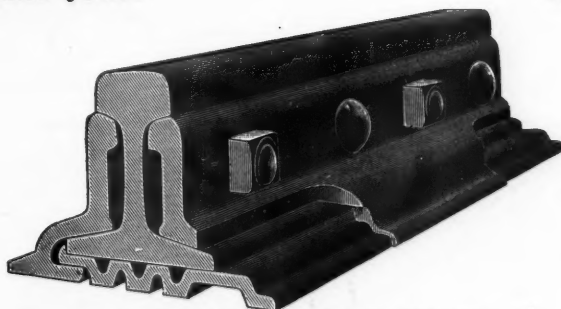
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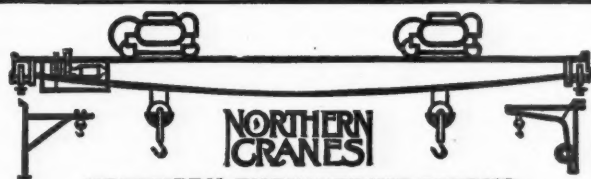
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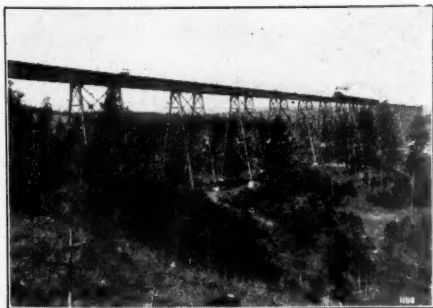
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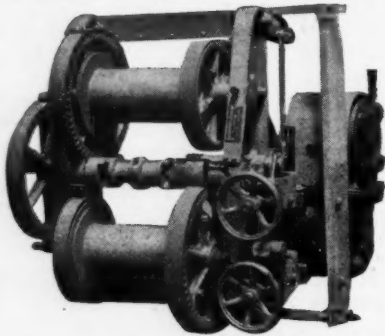
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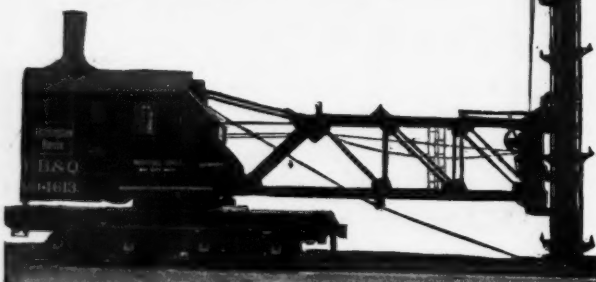
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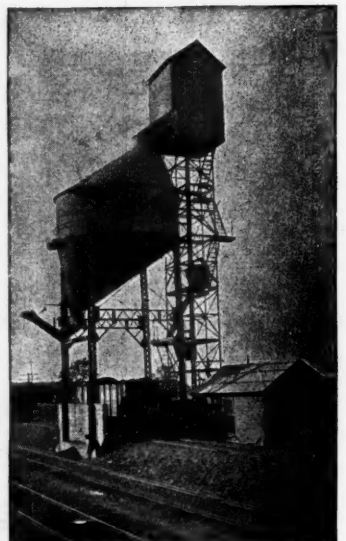
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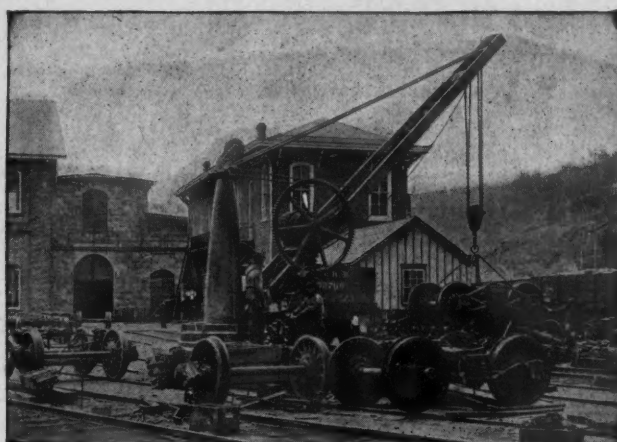
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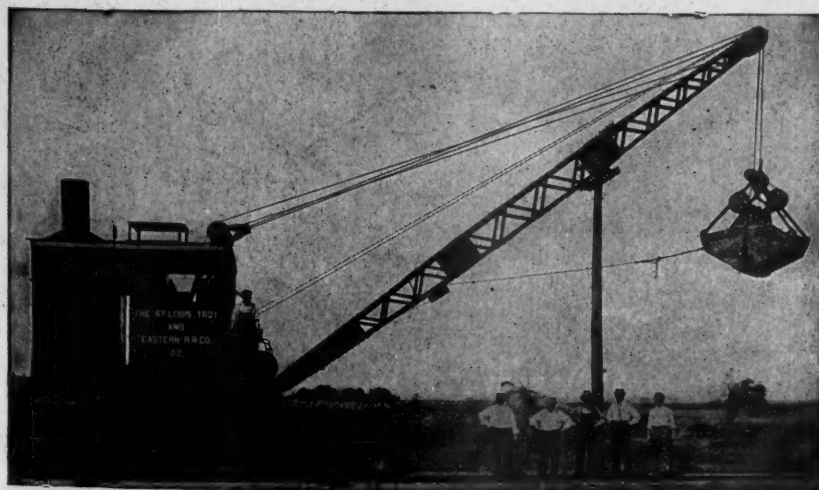
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